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ABSTRACT

The multiple-choice test items collected in this volume were selected from questions submitted by teachers in New South Wales for the Science Library of Test Items. The collection is intended as a resource to assist teachers in implementing and evaluating courses in the first 4 years of Australian secondary school. To ensure quality in the collection, items were inspected by a panel of experienced, practicing teachers for content validity and were pretested with a representative selection of year 10 students to establish the measurement efficiency of the items. Items are printed to be reproduced for classroom use, and are classified by content with an answer key and difficulty rating. Various classroom uses and test preparation procedures are discussed. The statistical criteria for item facility, item discrimination and distractor efficiency are described. (CM)

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SCIENCE

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LIBRARY OF TEST ITEMS

VOLUME ONE

TM820892

DEVELOPMENT OF THE LIBRARY

This collection of material is a first selection from the hundreds of questions submitted by teachers for inclusion in the Science Library of Test Items. It is intended as a resource to assist teachers to implement and evaluate courses in the first four years of secondary school.

Because the questions were submitted by classroom teachers from both Government and non-Government schools in all parts of the State, they constitute a cross-section of the ideas which currently pervade classroom practice.

To ensure quality in the collection, only those items which satisfied several quality control checks have been included. Foremost among these were:

(i) inspection by a panel of experienced, practising teachers;

(ii) a pretest with a representative selection of Year 10 students.

As well as sharing in the general editing and reviewing functions, the review panels checked each item for *content validity*. The pretest was used to establish the *efficiency* of the items as measuring instruments. Three of the major statistical criteria used were:

(i) Item Facility: The facility index measures the proportion of the sample candidature who answered the question correctly, All items in this collection have a facility index between .30 and .90.

(ii) Item Discrimination: This index measures the degree to which success on the item is correlated with success on the total test of which the item is a part. A commonly used index of discrimination is the point-biserial correlation coefficient. Every item in this collection attained a point-biserial correlation coefficient of at least 0.20. This means that on the pretest, each item added significantly to the total score of information about the relative achievement of the candidature.

(iii) Distractor Efficiency: Within each item, each distractor was chosen by at least 5% of the total candidature, except in the case of very easy items, where an even spread of respondents was sought.

For a test to be *reliable*, many features apart from these three must be considered. However, the proven quality of these items, as measured by these three criteria, makes it highly likely that any test chosen from this collection, and administered to *appropriate* classes, will be a more reliable instrument than teachers could normally produce without this assistance.

USING THE COLLECTION

Items in this collection may be reproduced for classroom use in any form desired by the teacher. To facilitate the preparation of printing masters particular attention has been given to both the diagrams and the layout of the items.

To assist the teacher, the items have been classified according to the content being tested and two pieces of information are provided below the item number:

(i) the key (or correct option), and;

(ii) the difficulty rating (1 - 5), which is based on the data obtained during the pre-testing programme. A question rated "1" was correctly answered by some 30 - 40% of students, while "5" indicates a correct response by 80 - 90% of students in the pre-test sample. Recent investigations have shown that while this information is useful as a general guide, item difficulties vary greatly when items are given to classes who have recently studied the material covered in given items. The ratings should not be confused with norms or goals: they are merely useful guidelines for teachers.

While some attempt has been made to group similar items, the numbers allocated to items are intended only to identify the items. The numbers were allotted as pages of items were prepared for printing.

It is suggested that items might be used for the following purposes:

1. As a source of items for short unit tests.

2. As a source of items for term tests.

3. As a source of ideas for in-school item construction.

4. As a basis for class discussions (it should be noted that stimulus material was NOT designed for use with the overhead projector. The letter size used in typing items would not be legible at more than 4 metres from the screen in an average classroom).

One important warning should be given to all teachers using this collection. Some areas of syllabus content and some syllabus aims are better suited to testing with multiple choice items than others. Consequently, this collection is unlikely to be balanced in its coverage. In addition, the inclusion of an item is not intended to imply that a particular piece of content or teaching strategy has a place in the curriculum. The final selection must lie with the teacher in the classroom who knows the interests and abilities of his students.

Comments, criticisms and suggestions from teachers are welcome. All correspondence should be addressed to:

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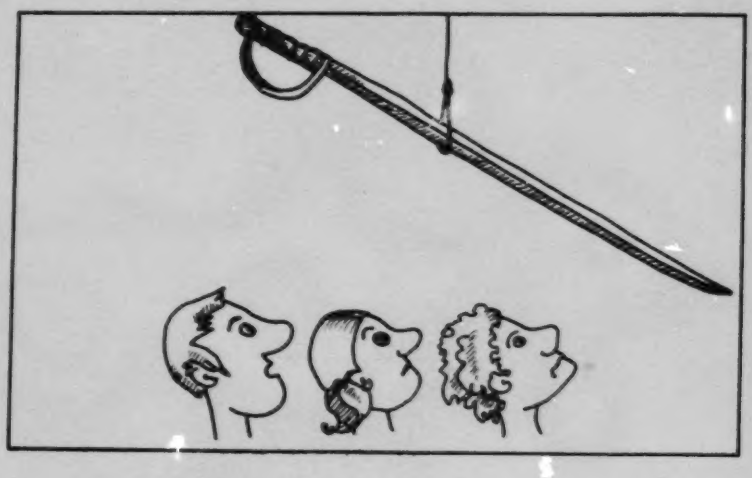
SYDNEY N.S.W. 2001

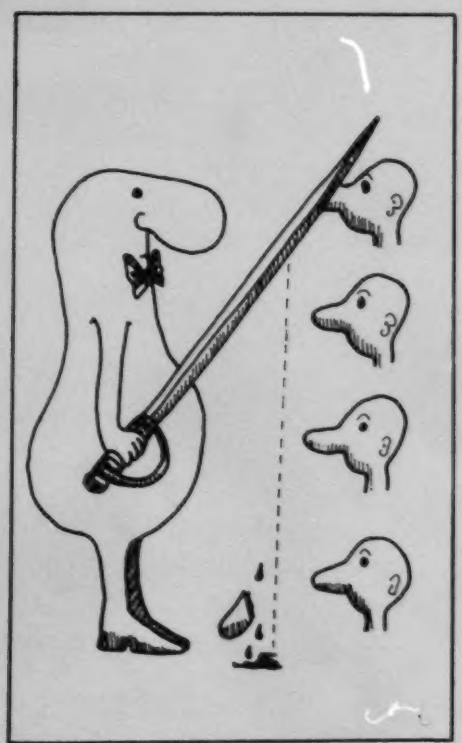
USING AN ITEM COLLECTION IN THE SCHOOL SITUATION

For the purposes of this discussion, the expression "item collection" can refer to either this collection, or subsequent editions of this collection, the A.C.E.R. item collection, and even to a collection of items made by teachers in a school.

The first step is to determine the purpose for which the test is being prepared. This is at least as important as determining the objectives and content which should be covered.

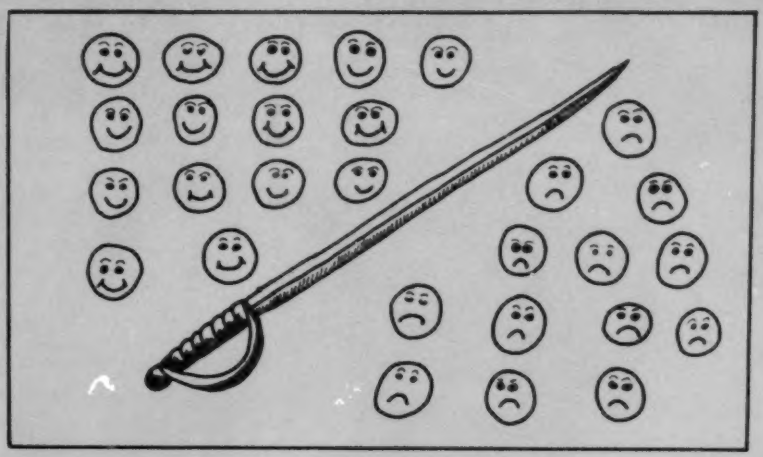
Some teachers use The Test as a threat which can be hung, like the sword of Damocles, over the students' heads: "Pay attention because there will be a test tomorrow".





Some teachers use the test as a tool for shaping their students and their students' responses.

At other times, the test may be used to identify two groups: successes and failures.



And the test may also be designed to confer the ultimate accolade on he/she who is Top Person.

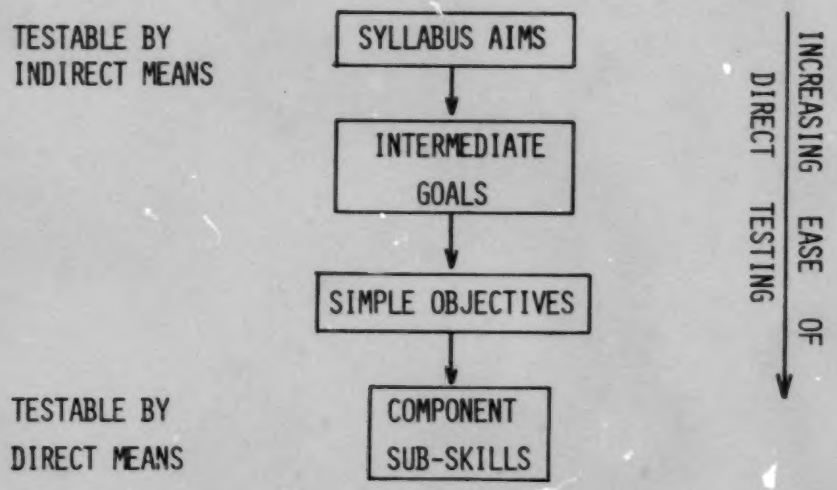
Tests are also used to find out what students know before a course (*readiness* or *pre-test*), and what they know at the end of a course (*post-test*). The readiness test can help teachers to decide how to teach a unit of work. The pre-test/post-test comparison can help teachers to make decisions about what they will teach next, and it will also show them how to improve the completed unit of work for future occasions.

Tests can also be used to evaluate student mastery of specific skills. A development programme in this area is under way, and information has been sent to schools about this project.

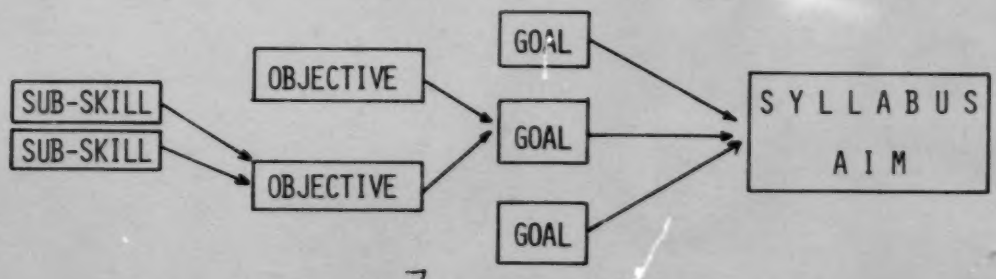
Preparing the test:

1. The identification of objectives and content

Teachers frequently speak of the "testing of aims", or more sensibly,"testing for the achievement of aims". While aims must be achieved if a course of teaching is to be judged effective, this achievement will *normally* be slow. This slowness derives from the fact that most aims involve the acquisition of a number of skills.



Thus the point which teachers should consider is not so much the aims to be tested as the *aims-based objectives* and the *aims-based component sub-skills* which when added together will make up the aim.



A question of test validity

Validity is a term with a set of special meanings in testing:

(i) *Criterion-related validity*: This involves the question: "does this test predict what it is supposed to predict?". Since class tests are rarely used for prediction of anything, this form of validity need not be further considered here.

(ii) *Construct validity*: This involves the question: "does this (e.g. intelligence) test measure what it purports to test (in this example, intelligence)?" A more useful example for science teachers might be "Does this test really test science, or does it test I.Q., guessing ability, or something else?"

If a test is constructed of items from this collection, it is fairly certain that the test will measure an undefined "science ability". This claim can be justified by referring to the statistical analysis undertaken on pre-tests.

The argument which follows is a statistical one. It has been simplified as far as is consistent with accuracy, but for those who do not wish to follow the argument through, the argument shows that the pre-test and analysis programmes offer confidence in the items as items which test "science ability".

* * * * * *

Each pre-test contains 25 or 30 different multiple choice questions. These have been carefully selected to cover a wide range of content, concepts, and skills in science. The tests were then given to random samples of students (200 - 300 in each case) throughout New South Wales. No one student did more than two tests, and many did only one science test.

One of the statistics calculated for each question is the *point-biserial correlation coefficient*. This is a measure of the extent to which students who scored well on the whole test answered a given question correctly. Since the tests cover a wide range of science, it follows that the coefficient should give a measure of the extent to which an item tests "science ability".

The range of the point-biserial correlation coefficient is from 1.00 to -1.00. The rejection level set for items in this collection is a point-biserial correlation coefficient of 0.20. Most of the items exceed 0.30, and many exceed 0.40. All items thus show a satisfactory level of discrimination.

* * * * * *

(iii) *Content validity*: This is largely in the eye of the beholder: if a given matter has been taught by a teacher as part of a science course, then he would see an item testing that matter as being valid. Other science teachers who had not covered that area might regard the item as invalid.

(iv) *Face validity*: Once again, this is in the eye of the beholder, but here the beholder is the student looking at the test. This is a problem more commonly encountered in psychological testing which is raised here for the sake of completeness.

2. Constructing a balanced test

Once the relevant aims have been reduced to manageable objectives, it is possible to construct a *test grid*. This should be a statement of intention only, and as such, be modified by developments as the test is prepared. Here is an example of a simplified grid which might be drawn up for a unit on local geology. It is not intended to be the definitive version of such a grid, and should not be used in real life.

Local geology - 20-item test outline - Bidjibarra High.				
	Knowledge of trends and sequences (4)	Knowledge of methodology (4)	Interpretation of data (6)	Problem-solving (6)
Local strata (5)	3	-	-	2
Rock identification (8)	-	2	4	2
Map reading (7)	1	2	2	2

The problem for the teacher now becomes one of selecting and/or writing twenty test items to fit the specification. As the test takes shape, it may become apparent that the available item collections do not supply sufficient items of the right kinds. In such a situation, it is suggested that teachers write suitable questions, either in multiple choice form or in some other form, such as "short answer" questions. Unless this attempt is made, there is a risk that teachers will allow the item collections to become the main determinants of the curriculum.

In the event that items can neither be found nor written to fit the test grid it may become necessary to change the grid to fit what is possible. In such a case, the deleted portions of the grid represent areas of learning which have been identified as important: assessment by other means should be considered. Possibly practical work or assignments could contribute information of such areas.

3. Practical aspects of test preparations

The items in item collections can in general be reproduced by using heat reproduction methods to make stencils. Pages should be assembled from either originals or good photocopies. In the case of this collection, the key (correct response) and the difficulty have been included below each item. For example, item No. 1 in this collection is annotated C3. This means that the correct answer is "C" and that the question was correctly answered by between 50% and 70% of all students in a pre-test sample.

Obviously, this should be hidden from students, as the test would otherwise become meaningless. Teachers should note that black print covered in masking tape or three layers of adhesive cellophane tape will not copy on a heat copier. It does, however, remain visible on the original from which the stencil was cut. *This does not apply if a light activated "scanner" stencil is cut.*

Photocopying and heat copying is justified in the case of item collection items because the type-face used has been selected for maximum clarity, and because many of the items contain complex diagrams. The same argument does not hold for most teacher written items.

In general, these are best reproduced by typing directly onto wax or spirit stencils. A separation of the "collection" items and the teacher-written items is thus likely to be found desirable. This would be supported if some of the teacher items required written answers. In such a case, the teacher-written section should follow the "collection" section, and it should start with any multiple choice items which have been written for the test. In this way, students will be less confused by unnecessarily frequent changes of item form.

4. Numbering Items

If "heat" stencils are to be made, then the question numbers should be written in soft pencil or with an ink which contains either carbon or metal. The "Bic" "Reproduction Ink" pen which has a red button, a black barrel, and the words "reproduction ink" on the barrel is suitable, as is "Rotring" ink. Other inks may also be suitable, but they should be tested first.

5. Reusing tests

If answer sheets are used, then tests may be used several times, especially if they are "unit tests". Where parallel classes are doing the same unit, two classes could do one test in consecutive periods of a double period. Where one unit is being repeated, the test would be given to each class in turn.

Under such conditions, teachers need to practise some vigilance, checking question papers for stray marks while the test is being done, and eliminating any paper with such marks.

A writer describes a food chain in the following way. 'A butterfly in search of nectar is devoured by a dragonfly, which is snapped up by a bull frog. The bull frog is eaten whole by a water snake, which in turn is eaten by a hawk. Here the food chain ends, as the hawk has no predator but man.' The writer is not accurate in saying 'here the food chain ends' because

A. the hawk will be eaten by the man.
B. the hawk eats mice as well as snakes.
C. the hawk will be acted upon by decomposers.
D. this food chain did not start with a producer.

C.3 001

Green plants obtain nitrogen compounds from the soil despite the vast reservoir of nitrogen in the air. This is chiefly because

A. animals use most of the atmospheric nitrogen near the ground.
B. nitrogen being less dense than air rises above the maximum plant height.
C. nitrogen gas cannot pass through plant cell membranes.
D. the plants cannot use nitrogen in its gaseous form.

D.2 002

A pupil placed a piece of bread under an iron sheet that was lying on the ground. One day later the pupil returned to the spot and found that the sheet of iron was undisturbed but the bread had gone. The <u>most likely</u> explanation for the disappearance of the bread was that it

A. had been decomposed by bacteria or fungi.
B. was removed by consumer organisms.
C. dissolved into the soil under the iron.
D. had been washed away by water.

B.3 003

The next two questions refer to the diagram below.

If the supply of frogs happened to decrease in numbers then the supply of grasshoppers should

A. also decrease in numbers.
B. then increase in numbers.
C. remain the same in number.
D. then be eaten by eagles.

B.4

004

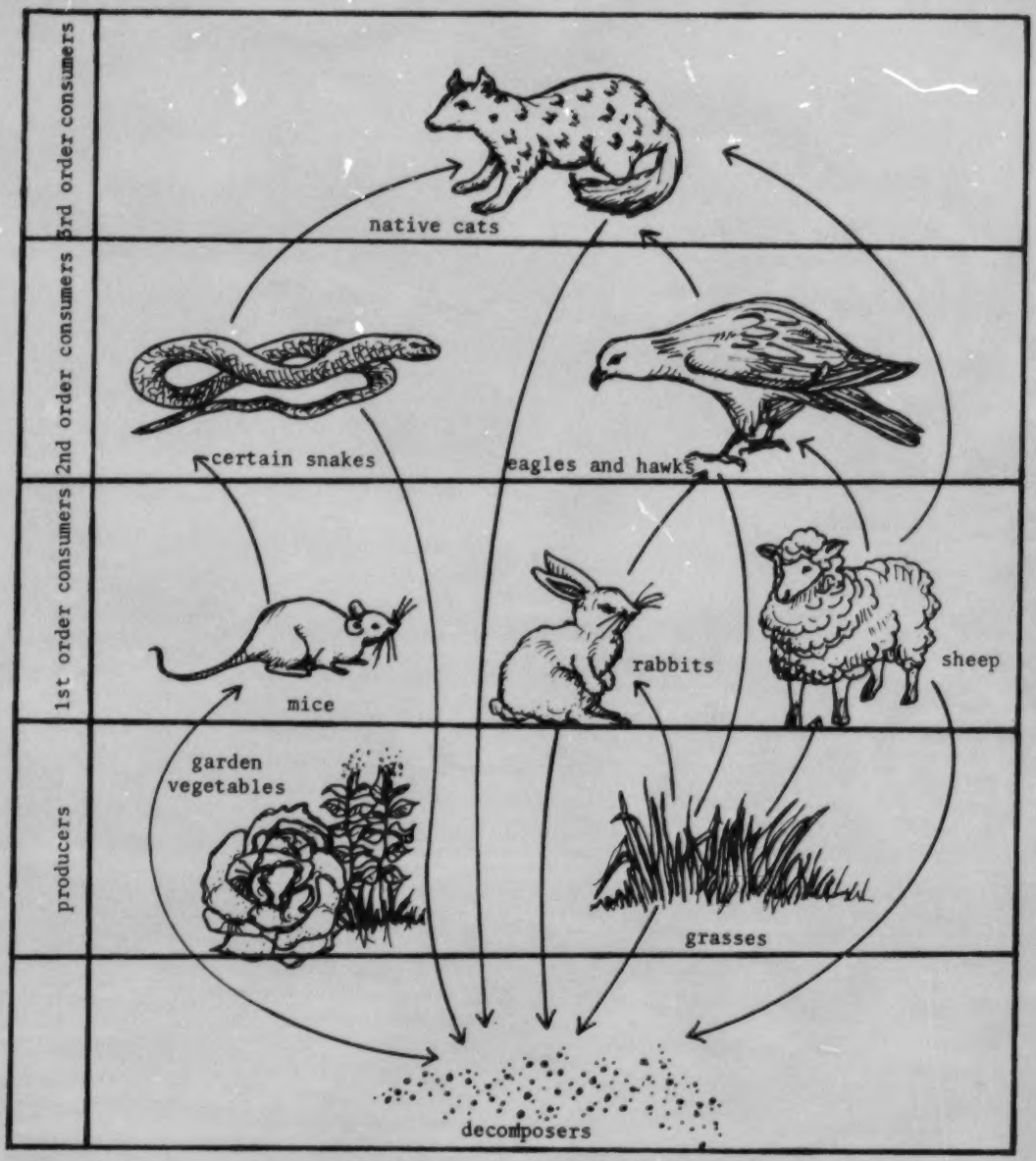
Man has hunted the eagle and it is considered to be decreasing at an alarming rate. What main effect would this have on the other animals, according to the diagram?

A. The snakes and frogs would decrease also in number.
B. Only the grasshopper would decrease in number.
C. The frogs would decrease, thus causing an increase in grasshopper numbers.
D. Only the snakes would decrease.

C.3

005

The next five questions refer to the following diagram of a food web.



The questions referring to this diagram appear on the next page.

The questions on this page refer to the diagram on the previous page.

One of the following groups contains decomposer organisms only. Which one?

A. bacteria, fungi.
B. native cats, bacteria.
C. flies, native cats.
D. fungi, mosses.

A.3 006

If all the snakes were killed by a disease, which organisms would initially increase in numbers according to this food web?

A. rabbits.
B. mice.
C. vegetables.
D. hawks.

B.5 007

According to this food web, if hawks and eagles began to eat mice instead of sheep, what effect would this have on the abundance of snakes?

A. increase.
B. decrease.
C. no change.
D. insufficient information.

B.4 008

According to this food web, which organism has the most varied diet?

A. snakes.
B. vegetables.
C. eagles.
D. native cats.

D.4 009

Native cats are classified as 3rd order consumers on this food web. They could also be classified as 2nd order consumers because they eat

A. snakes.
B. eagles.
C. sheep.
D. hawks.

C.3 010

The tropical disease Malaria is carried by one species of mosquito. To combat Malaria thin layers of oil have been sprayed on the surface of water where mosquitoes breed. The most likely reason to spray oil on the surface of the water is that the oil

A. sinks and poisons the larvae in the water.
B. floats on the surface of the water and stops the larvae getting air.
C. sinks and gets into the bristles thus stopping the larvae swimming.
D. floats on the surface and stops the larvae from getting food.

B.3 011

Many different theories have been put forward concerning the evolution of man and several are still accepted. The main reason why no single theory has been accepted by everybody is that

A. all scientists prefer their own ideas to those of others.
B. man actually evolved in many different ways.
C. the evidence is limited and may be interpreted in different ways.
D. the ideas of many scientists are now out of date.

C.3 012

A biology student found that if he cut a small worm in half the tail end grew a new head and the head end grew a new tail. He also found that a starfish, if it lost an arm would grow a new one and the arm could grow into a new starfish.

From this the student could conclude:

A. all invertebrates reproduce by dividing in half and growing new parts.
B. some animals can grow new body parts when pieces are lost.
C. worms are closely related to starfish.
D. worms and starfish can't have blood or they would have bled to death.

B.2 013

This question refers to the newspaper report below.

HUGE SKULLS

At least 40 skeletons of a very early type of aboriginal have been discovered in northern Victoria.

Scientists say the find is one of the most important of its kind in the world.

They say it indicates that two different types of aboriginals lived on the Australian continent at the same time, about 20,000 years ago.

One type of aboriginal, physically as modern as the present day aboriginal, is known to have inhabited Australia 25,000 years ago.

But the recent find is of a type with physical characteristics not seen in the modern aboriginal.

The jaws of some of the skulls are as big as any found in the world.

One massive jaw is about the same size as the Heidelberg Jaw, generally accepted previously by anthropologists as the biggest in existence.

Several other jaws found at the site, about 200 miles north of Melbourne, are only slightly smaller than the Heidelberg Jaw.

The Heidelberg Man, discovered in Germany in 1907, is known to have lived between 300,000 and 400,000 years ago.

The skulls also show some resemblance to Java Man *(Homo Erectus)* who lived on earth about 500,000 years ago.

The skulls referred to in the news report establish the following fact

A. aborigines have occupied Australia for 300,000 to 400,000 years.

B. the skulls provide evidence for the missing link.

C. Java Man migrated to Australia about 500,000 years ago.

D. two types of aborigines occupied Australia about 20,000 years ago.

This question refers to this table which shows the percentage of people of various races having various blood groupings.

POPULATION GROUP	BLOOD GROUP PERCENTAGES			
	O	A	B	AB
Australian aborigines	approx. 50	approx. 50	present in small numbers	0
Australians of European Descent	49	38	10	3
Chinese	46	23	25	6
English	43	48	8	1
Germans	40	40	15	5
Greeks	42	40	14	4
Indians	30	25	37	8
Japanese	30	38	22	10
South American Indians	100	0	0	0

Which blood group is most common in the human race?

A. A
B. B
C. AB
D. O

D.5 015

A teacher tells his class that the theory of evolution states "man and apes had a common ancestor". This statement is

A. a proven fact because scientists have produced men from apes in laboratories.
B. impossible because apes have longer arms, compared to their body length, than man.
C. a working scientific hypothesis because it fits many known facts.
D. evidence that the teacher does not understand evolution since it is known that man evolved from apes.

C.5 016

A teacher scattered 250 different coloured toothpicks over a section of a turfed school oval and then set his class 5 minutes to find them.
The results were as follows:

Colour of Toothpicks	Original Number	Number found
Red	50	49
Yellow	50	44
Blue	50	39
Green	50	26
Natural	50	41

The principle illustrated by this experiment is best used by

A. polar bears in the Arctic.
B. brightly coloured tropical fish.
C. seagulls hunting for food.
D. crocodiles lying on a river bank.

A.1

017

A *Hydra* is a small animal which is green because it has algae living inside it. The algae produce oxygen which the *Hydra* uses and the *Hydra* produces carbon dioxide which the algae use. The relationship between the algae and the *Hydra* can best be described as

A. parasitism.
B. mutualism.
C. saprophytism.
D. commensalism.

B.2

018

A small European animal called the weasel is normally a solitary predator. When food is short, however, they band together and hunt in packs of several hundred. This behaviour benefits the survival of the species by allowing them to

A. mate freely and prevent inbreeding.
B. eat each other and survive.
C. sleep safe from other animals.
D. hunt larger animals than usual.

D.3

019

The next three questions refer to the following information.

There are several factors which influence the availability and use of oxygen in man. The table below shows the average values for persons suffering from oxygen deficiencies for a variety of reasons. The average value for healthy individuals is also given.

Group	Haemoglobin content of blood ($g/100cm^3$ of blood)	Oxygen content of arterial blood ($cm^3/100cm^3$ blood)	Oxygen content of venous blood ($cm^3/100cm^3$ blood)	Volume of blood pumped by heart (dm^3/minute)
Healthy	15	19	15	5.0
A	15	15	12	6.6
B	8	9.5	6.5	7.0
C	16	20	13	3.0
D	15	19	18	5.0

Which set of data is most consistent with that of a person suffering from a dietary iron deficiency?

A. A. C. C.
B. B. D. D.

B.2

020

Which set of data is consistent with that of a person with a high tissue content of a poison which prevents the use of oxygen in the tissues?

A. A. C. C.
B. B. D. D.

D.1

021

Which set of data is consistent with that of a person who has just climbed a mountain to a point where atmospheric oxygen is noticeably less than that usually experienced?

A. A. C. C.
B. B. D. D.

A.1

022

Haemorrhage is the term used to describe loss of blood from the body.

The immediate effect of a severe haemorrhage in man is

A. a decrease in arterial blood pressure.
B. an increase in arterial blood pressure.
C. an increase in the rate of arterial blood flow.
D. a change in the proportion of salts in the blood.

A.2

023

William Harvey is well known as the discoverer of the circulation of blood. After many observations he wrote the following:

> "The heart appears to be a hollow muscle(1), when the muscle acts the space inside gets smaller and squeezes out the blood(2). That is why it becomes pale(3). When the muscle relaxes, blood flows into the larger cavity and the heart gets redder(4). The heart is therefore a pump(5).

The statements which you regard as conclusions that William Harvey has made are

A. 1, 2 and 4.
B. 3 and 5.
C. 4 and 5.
D. 1, 2 and 3.

B.1

024

The following is a list of four human cell types.

P. Red blood cell.
Q. Sperm cell.
R. Cell from the surface of the skin.
S. White blood cell.

In which of the following pairs of the above cell types are both members capable of independent movement?

A. P and Q.
B. P and R.
C. R and S.
D. Q and S.

D.1

025

In mammals, the placenta is a structure which

A. allows nutriment to pass from the blood of the mother to the blood of the foetus.
B. assists in the circulation of blood from the mother to the embryo.
C. connects the umbilical cord to the blood of the foetus.
D. stores the waste products from the foetus.

A.2 026

The next three questions refer to the following information.

In mice there are a total of 40 chromosomes in each body cell and sex determination is controlled in the same way as in man. That is, a sex chromosome complement of XY is found in normal males and the XX complement determines female characteristics.

How many chromosomes does a mouse receive from each parent.

A. 19 B. 20 C. 21 D. 40

B.3 027

How many non-sex chromosomes are normally found in the body cells of a female mouse?

A. 19 B. 20 C. 38 D. 40

C.1 028

How many non-sex chromosomes are present in a mouse gamete?

A. 18 B. 19 C. 20 D. 38

B.1 029

The next three questions refer to the following information.

The table below lists the characteristics of five species of plants.

	P	Q	R	S	T
normal habitat	aquatic	land	land	land	aquatic
vascular tissue present	yes	yes	yes	no	no
produces flowers	yes	no	yes	no	no
produces cones	no	yes	no	no	no
produces seed	yes	yes	yes	no	no
manufactures own food	yes	yes	yes	no	yes

The species which are most likely to be included in the angiosperm group are

A. P, Q and R
B. P and R.
C. Q, R and S.
D. R and T.

B.1 030

The species which is most likely to be a fungus is

A. P B. Q C. S D. T

C.1 031

The species which is most likely to be a gymnosperm is

A. P B. Q C. R D. S

B.1 032

Pollen shape and size can be as different as the flowers that produce it. Pollen may be carried by wind and also transported by insects. You would expect pollen that is carried by wind to be as

A. heavy as possible.
B. large as possible.
C. light as possible.
D. small as possible.

C.4 033

Pollen that is predominantly carried by insects would be carried more easily if the flower pollen were

A. heavy.
B. sticky.
C. very large.
D. smooth.

B.5 034

After a robbery a detective looks for clues. Sometimes he may find a footprint in a garden which he then examines.
From the size and depth of the foot print he can tell how tall and heavy the suspect is.
At what stage does the detective make an hypothesis?

A. Searching for clues.
B. Finding a footprint.
C. Measuring the footprint.
D. Describing the suspect.

D.3 035

An orchardist may grow new apple trees by using cuttings of trees already established in his orchard. Which of the following would be true of a plant grown in this way?
The new cutting will

A. be similar to the parent plant.
B. reach maturity much faster than a plant grown from seedling.
C. tend to be more resistant to disease.
D. have a better yield of fruit than the parent plant.

A.3 036

The next 4 questions refer to the following information.

One of the many problems faced by farmers is the continual growth of weeds in pastures. The weeds, which generally have poor nutrition value for stock (sheep, cattle, etc.), will grow at the expense of more useful stock food, if not continually checked. A method of control, which is both scientifically and economically sound, is to provide conditions in the pasture which useful grasses and clovers can take advantage of more readily than can weeds.

One such method depends on first raising the soil fertility and sowing types of grasses and clovers which will benefit more from the increased fertility than will the weeds. In this way, the weeds will gradually cover a decreasing proportion of the pasture. For example, the fertilizer superphosphate, and the pasture plant subterranean clover, have helped to combat the weed, St. John's wort.

Another method of control depends on the fact that some weeds grow quite quickly in a newly sown pasture. If two grasses, one a quick growing variety, are sown in a pasture together, the first can be harvested before the other has reached a stage of growth where it will be affected by the harvesting. However, a quick growing weed will suffer a severe setback because this harvesting will remove much of the weed plant before it has had time to seed or become firmly established.

Which one of the following facts about weeds is NOT contained in the above statement?

A. Some weeds grow quite quickly in newly sown pastures.
B. The growth of weeds is generally combatted by the planting of subterranean clover.
C. Weeds generally provide little of nutritious value for sheep.
D. The continual growth of weeds in pastures is a problem for many farmers.

B.2 037

The main effect of applying superphosphate to a pasture is that it

A. lowers the resistance of St. John's wort.
B. increases the soil fertility.
C. increases the growth rate of subterranean clover.
D. restricts the growth of weeds.

B.1 038

Two more questions appear on the next page.

The first two questions on this page refer to the information on the previous page.

If both quick growing and slow growing grasses are planted in a pasture then after the quick growing grasses have been harvested the slow growing grasses will have

A. only slow growing weeds to compete with.
B. no weeds to compete with.
C. only quick growing weeds to compete with.
D. both slow growing and quick growing weeds to compete with.

A.2 039

Suppose there are two identical boxes of low fertility soil, one in which St. John's wort is growing, and the other in which subterranean clover is growing. If superphosphate is applied to the soil in both boxes, which one of the following is the most likely outcome?

A. The growth rate of the clover will increase but the growth rate of the St. John's wort will decrease.
B. The growth rate of the clover and the St. John's wort will both increase by the same amount.
C. The growth rate of the clover and the St. John's wort will both increase but the increase will be greater in the case of the St. John's wort.
D. The growth rate of the clover and the St. John's wort will both increase but the increase will be greater in the case of the clover.

D.1 040

If carbon dioxide is bubbled through limewater a white substance forms. Up to a certain point the more carbon dioxide used the whiter the limewater becomes. When air is bubbled through the limewater for a short time a faint milky appearance results. When a person breathes out into limewater for the same length of time a strong milky appearance results. The best conclusion one could draw from this experiment is

A. the air we breathe out contains carbon dioxide.
B. the air we breathe in contains carbon dioxide.
C. we breathe out more carbon dioxide than we breathe in.
D. we breathe in more carbon dioxide than we breathe out.

C.2 041

Which one of the following has the least effect on the rate of photosynthesis?

A. Oxygen.
B. Carbon dioxide.
C. Chlorophyll.
D. Light intensity.

A.1 042

When proteins are digested and ready to be absorbed in the small intestine, they are in the form of

A. glucose.
B. fatty acids.
C. amino acids.
D. glycerol.

C.1 043

Respiration in animals occurs

A. on the internal surface of the lungs.
B. in the blood only.
C. through the external surface of the body.
D. in every living cell.

D.3 044

If we were able to observe all the cells in the adult elephant and in the baby elephant, then we would find that, compared with the cells in the baby elephant, the cells in the adult elephant are

A. much larger.
B. differently shaped.
C. more numerous.
D. all older.

C.3 045

Which of the following would occur as a result of a plant making its own food?

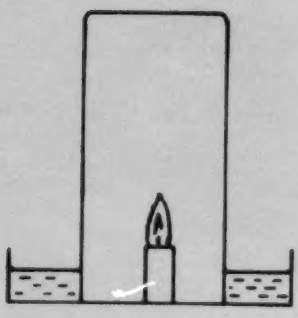
A. Oxygen is returned to the air.
B. Water is taken in by the leaves.
C. Sunlight is made into sugar.
D. Leaf colour changes from green to yellow.

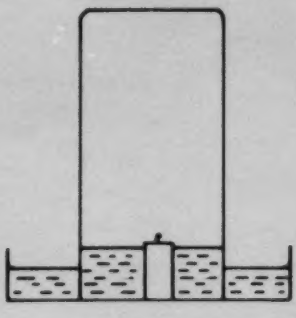
A.2 046

The next four questions refer to the information below.

A student placed a lighted candle in a shallow pan of water. He inverted a bottle over the burning candle and performed the following three experiments:

I. He measured the time required for the candle to stop burning.
II. He then removed the bottle, relit the candle, filled the bottle with exhaled air, and again inverted it over the candle.
III. He repeated this second part of his experiment, but, before filling the bottle with exhaled air he ran 100 metres at top speed.





The probable purpose of these experiments was to show that

A. inhaled and exhaled air differ in composition.
B. exhaled air contains less carbon dioxide than inhaled air.
C. combustion releases heat and carbon dioxide.
D. respiration produces heat.

A.1

047

See further items on next page.

The next three questions refer to information on the previous page.

An observation which the student would make is that the

A. atmosphere exerts pressure.
B. atmosphere contains oxygen.
C. water rose inside the bottle.
D. inhaled air contains carbon dioxide.

C.1

048

As a result of the experiment the student might be justified in concluding that the exhaled air

A. contains carbon dioxide.
B. contains no oxygen.
C. has less carbon dioxide than inhaled air.
D. has less oxygen than inhaled air.

D.2

049

As a result of this experiment the student might also be justified in concluding that

A. activity results in a higher percentage of oxygen in exhaled air.
B. activity results in a higher percentage of carbon dioxide in exhaled air.
C. respiration is similar to burning.
D. respiration produces more carbon dioxide than burning.

B.2

050

In a study of circulation in mammals a dissection of a heart is made.

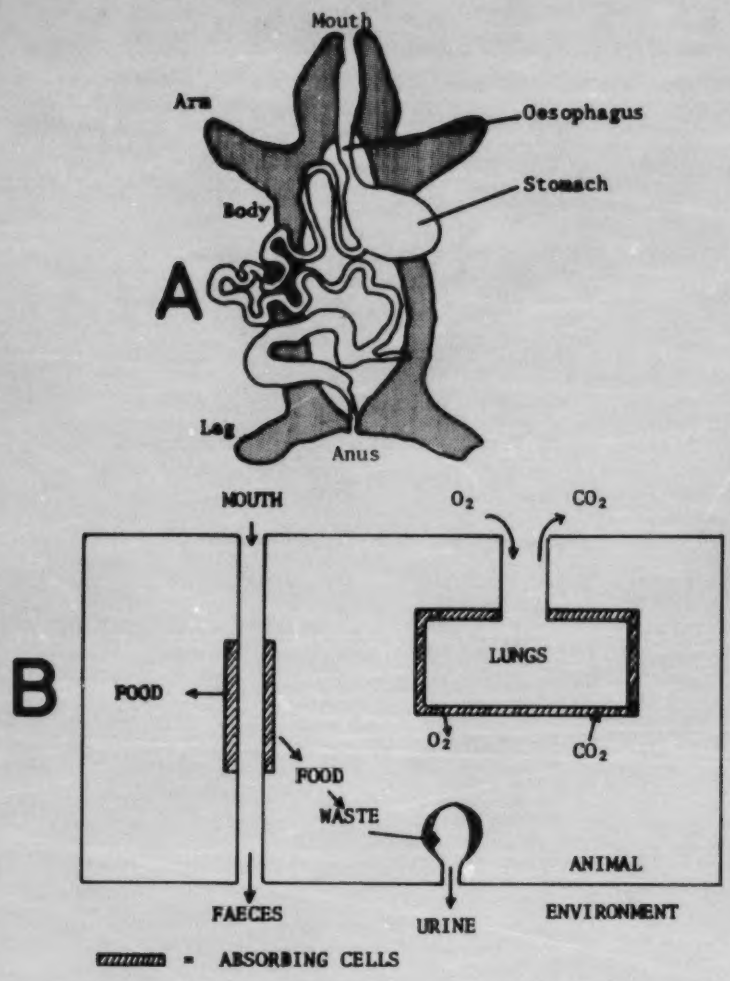
Which of the following statements <u>cannot</u> be checked by a student by making simple observations?

A. Muscular walls of the lower compartments of the heart are thicker than those in the upper part.
B. Valves in the heart prevent back flow from the ventricle to the atrium.
C. Blood carries digested food from the heart to the cells.
D. Blood is carried from the right side of the heart through arteries.

C.3

051

This question refers to these two diagrams.



Consider the diagrams above. Diagram B is a simplified version of Diagram A.

Which part of Diagram B is incorrect because it is not shown in Diagram A? Not all parts of the diagrams have been labelled:

A. oesophagus.
B. lungs.
C. anus.
D. intestines.

B.2

052

Which one of the following is a list of sense organs?

A. Lungs, brain, stomach.
B. Eyes, ears, tongue.
C. Liver, kidney, nose.
D. Heart, pancreas, spinal cord.

B.5 053

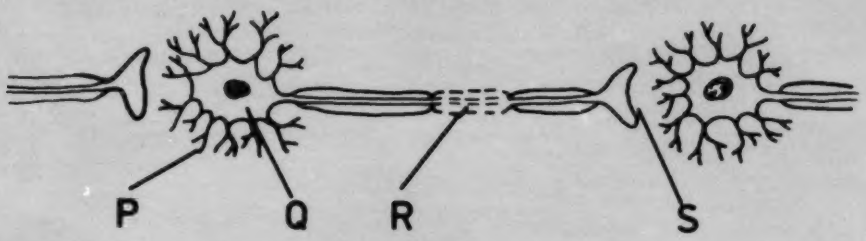
Which of the following functions could NOT be carried out if both kidneys were removed from the body of a mammal?

A. Carrying of oxygen to the cells.
B. Removal of wastes from the blood.
C. Obtaining information by the senses.
D. Regulating of body temperature.

B.4 054

The next three questions refer to the following information.

The following diagram shows a nerve cell and its interconnections with two other nerve cells of a nerve pathway.



The synapse is labelled

A. P B. Q C. R D. S

D.1 055

The structure labelled P is

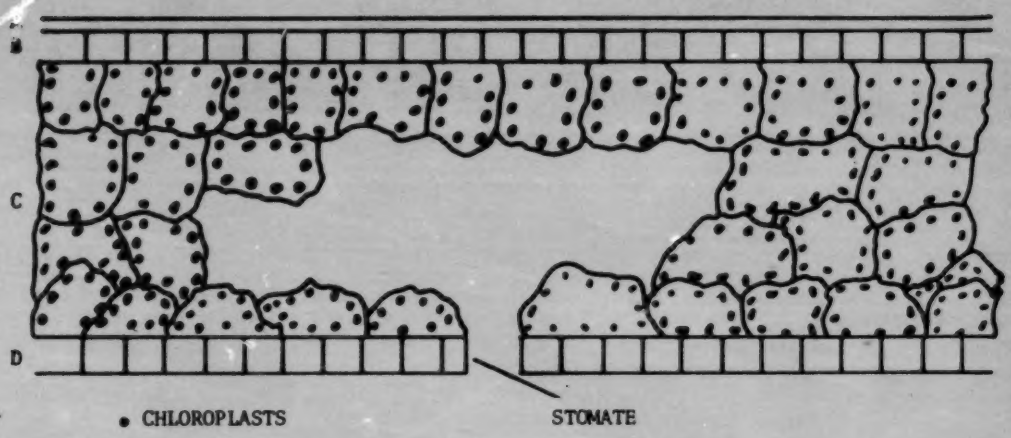
A. a cell body.
B. a dendrite.
C. an axon.
D. a sheath.

B.1 056

You can best avoid an unpleasant flavour by

A. holding your nose
B. closing your eyes.
C. plugging your ears.
D. cleaning your teeth.

A.3 057



Photosynthesis is most likely to occur in the cells found in layer

A. A.
B. B.
C. C.
D. D.

C.4

058

Which of the following would be the best comment about the picture above?

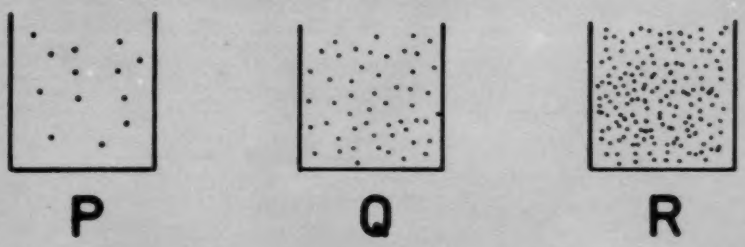
A. The heart would be further up since trees grow faster.
B. The heart would not have moved since trees grow in height from the top.
C. There would be branches around the heart.
D. The heart certainly would be overgrown by bark.

B.2

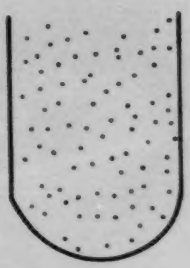
059

This question refers to the diagram below.

If the following diagrams represent the concentration of water molecules in three containers



and the diagram below represents the concentration of water molecules in a root hair



then it would be expected that the root hair would

A. swell if placed in container P.
B. shrink if placed in container Q.
C. take in water if placed in container R.
D. burst if placed in container R.

C.2 060

Mammals are made up of a number of different body systems, all of which function together as an integrated whole.

Which of the following would result if the brain of a mammal was destroyed but all other systems continued to function?

A. Inability to digest food.
B. Heart would stop beating.
C. Reflexes would cease to function.
D. No co-ordination of body functions.

D.3 061

VERTEBRATE	NUMBER OF OFFSPRING	METHOD OF REPRODUCTION	EGGS LAID	CARED FOR BY PARENTS	BODY COVERING
Fish	Hundreds	Sexual	Yes	No	Scales
Amphibians	Hundreds	Sexual	Yes	No	Slimy skin
Reptile	Forty	Sexual	Yes	No	Horny scales
Bird	1 - 5	Sexual	Yes	Yes	Feathers
Mammal	1 - 10	Sexual	No	Yes	Hair

From the information given the best explanation of the lower numbers of offspring produced by birds and mammals is

A. the method of reproduction.
B. whether eggs are laid or not.
C. whether the young are cared for by parents.
D. the type of body covering of the animal.

C.2

062

Read the following poem and answer the question which follows:

PARTNERS by Ivan Currutherinski

I am the breeze
and I scurry to and fro
to make the clouds go, scudding
from the seas to the land.
I travel everywhere
with my striped friend
the busy, buzzing lady.
We are friends, the lady and I.
Without us the wattle tree
would never live to see the day.
No gum tree or giant oak
would grace the earth
without our toil.

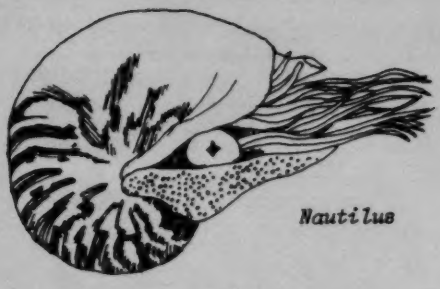
Of the following, the process whereby the breeze and the "busy,buzzing lady" could be regarded as <u>partners</u> would most likely be

A. growth.
B. reproduction.
C. assimilation.
D. responding.

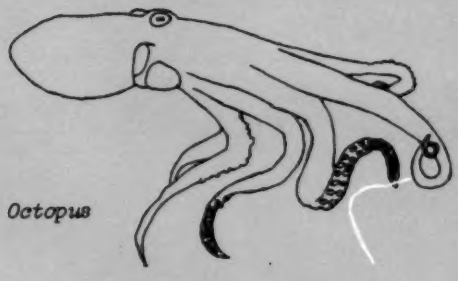
B.2

063

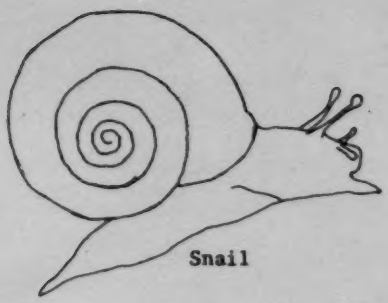
The four animals drawn below all belong to the group known as the molluscs.



Nautilus



Octopus



Snail

Oyster

The reason they are grouped as molluscs is that they possess

A. coiled shells.
B. soft bodies.
C. paired eyes.
D. tentacles.

B.4

064

Humans working in the presence of the products of radioactive decay must be shielded since the products are dangerous to health. From which of the following radioactive decay products do humans require the most shielding?

A. α (alpha) particles.
B. $\beta-$ (beta minus) particles.
C. $\beta+$ (beta plus) particles.
D. γ (gamma) rays.

D.3

065

Adaptations possessed by rock platform organisms include those for:

1. holding on.
2. preventing drying out.
3. feeding by filtering water.
4. breathing underwater.

The blue periwinkle, Melaraphe, is found on the upper areas of rock platforms. It is exposed for much of the time and may suffer buffeting by waves.

Of the adaptations mentioned above you would expect Melaraphe to possess

A. 1 and 2.
B. 1 and 3.
C. 2 and 4.
D. 3 and 4.

A.2

066

In the October issue of National Geographic, 1975, there is an article on Desert Potholes and the organisms found there. Even when the hole contains water, the amount, the temperature, and the chemistry may change radically in a matter of minutes. For those organisms in the potholes, you would expect their life cycle to

A. be very short.
B. take a period of weeks.
C. begin when the water evaporates.
D. be controlled by water temperature.

A.1

067

Organisms found in a paddock often tend to burrow under the leaf litter.

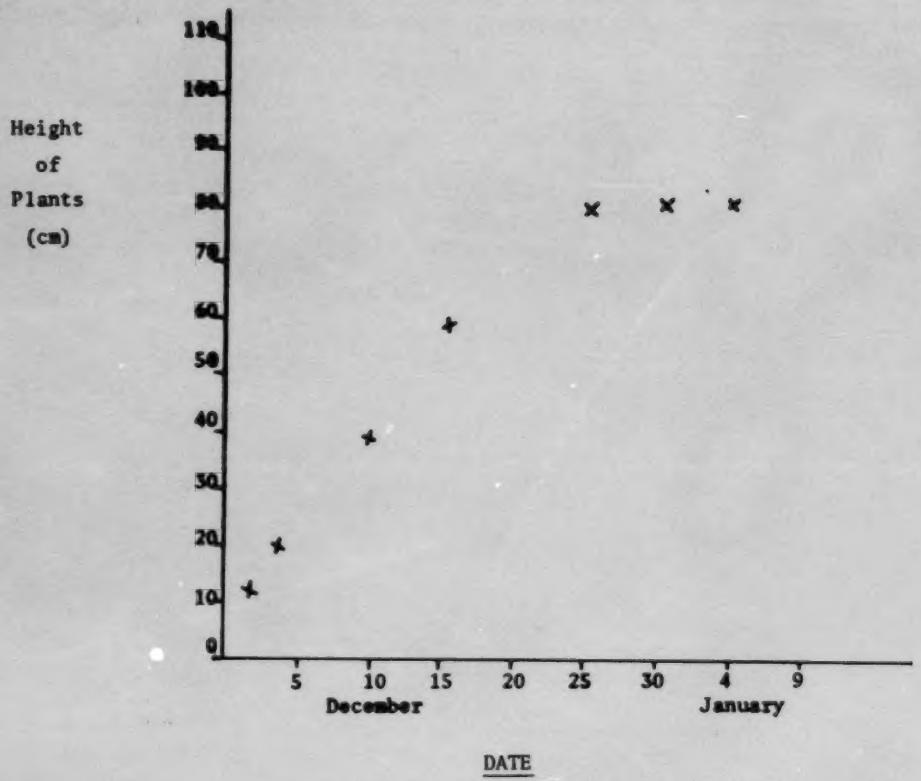
The most likely explanation which accounts for this burrowing behaviour is that

A. no food is available on the surface.
B. they cannot breathe on the surface.
C. the surface temperature is too cold.
D. light has a harmful effect on them.

D.2

068

This question refers to the graph below.



An agricultural scientist in New South Wales growing tomato plants in a regularly watered garden plot measured the height of a plant at various times during its growth in December and January. These heights were plotted on the graph above. Complete the graph and answer the question below.

The height of the tomato plant on the 20th December was probably closest to

A. 20 cm.
B. 60 cm.
C. 70 cm.
D. 80 cm.

Some animals, such as owls and possums, which are more active when there is little light have large eyes. Others, such as bats and moles, have small weak eyes. From this we can conclude that moles and bats

A. move with greater difficulty than owls and possums.
B. are more intelligent than owls and possums.
C. are carnivores.
D. use senses other than sight.

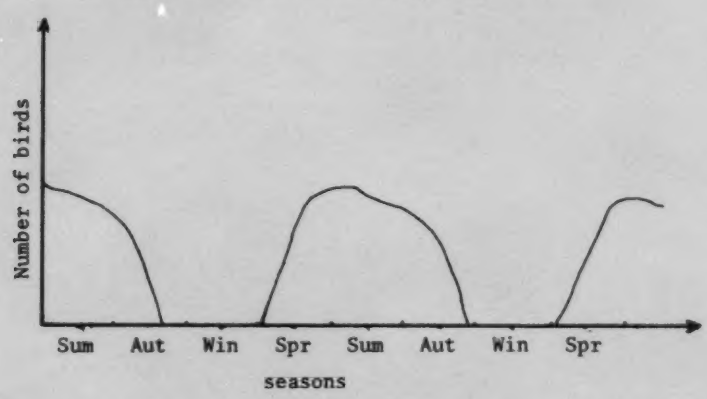
D.5 070

In using "biological control" to reduce the damage caused by a pest, the controlling organism should be very carefully studied to make sure that it

A. only kills that one pest.
B. reproduces very rapidly.
C. cannot fly to other areas.
D. has a short life span.

A.3 071

A biologist studied the changes in population number for a bird species over a continuous period of two years. From his data he drew this graph:



Which of the following is a reasonable conclusion to be drawn from the graph?

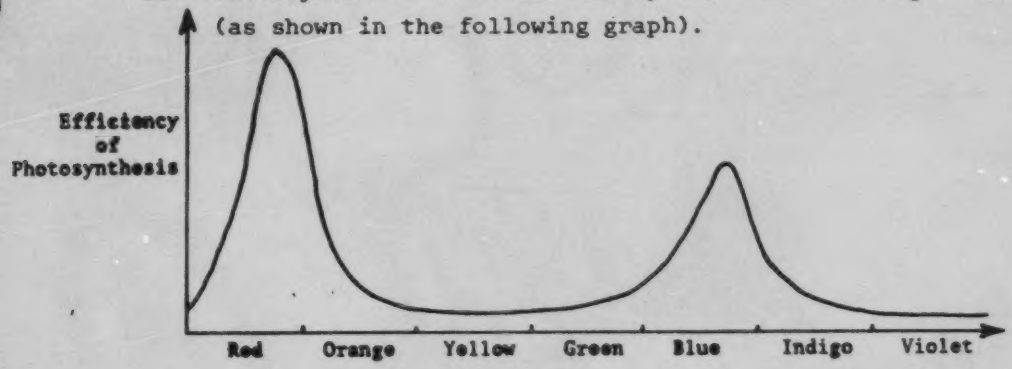
A. There is a high birth rate in the population in autumn.
B. This species of bird is a migratory one.
C. The breeding season for this species is in early summer.
D. There is a high death rate in the population of this species in autumn.

B.3 072

A scientist often uses known data to predict the result of an experiment. Read the following data:

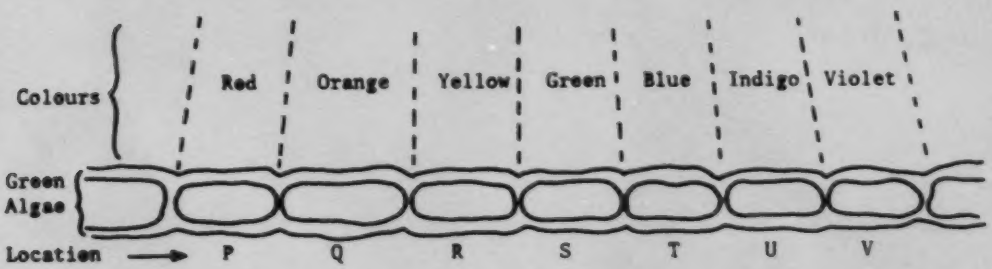
I. Green algae are able to photosynthesise and in so doing, release oxygen.

II. Photosynthesis is influenced by the colour of light used (as shown in the following graph).



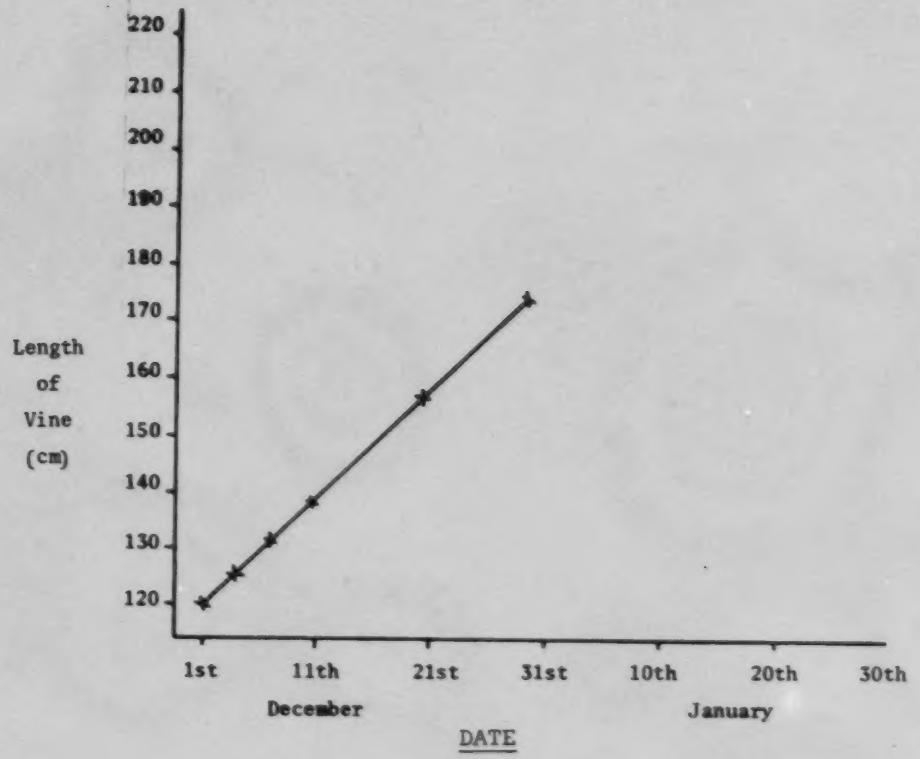
III. Bacteria will accumulate around plants and concentrate their numbers wherever the plant is giving off most oxygen.

If we use a single strand of green algae cells and illuminate the strand with light of different colours, where would the scientist look with his microscope to find most of the oxygen sensitive bacteria?



A. P and T
B. Q and U
C. R and S
D. P and S

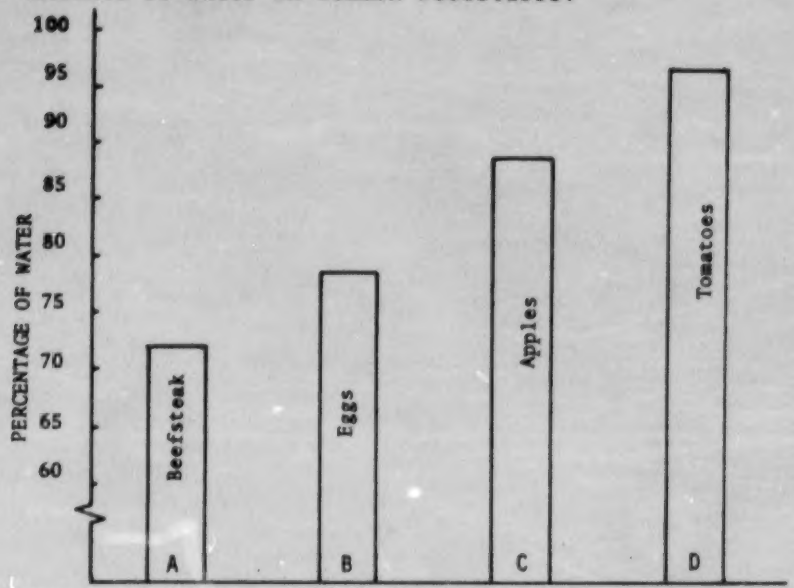
A student studies the growth of a climbing plant which begins to grow in November and continues to grow at a regular rate throughout the summer. Its length is measured several times during December and the growth is plotted on the graph below.



From the graph, the length of the plant on the 12th January could be predicted to be

A. impossible to estimate.
B. unknown because of uncertainty.
C. 200 centimetres.
D. 180 centimetres.

Observe the following graphs which show the relative amounts of water in common foodstuffs.



Equal weights of each of the above foods are placed in an oven and heated for 20 minutes at a temperature of 100°C. The food which would lose the greatest amount of weight would be

A. beefsteak.
B. eggs.
C. apples.
D. tomatoes.

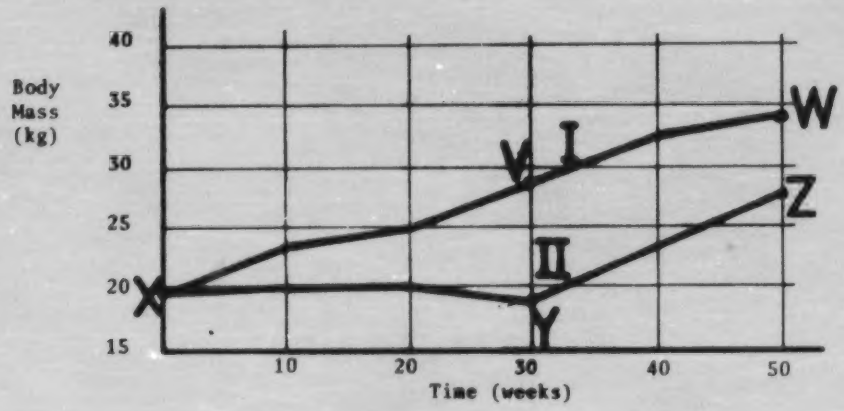
D.4

075

The next two questions refer to the following information.

Cobalt metal is required in small quantities in the diet of sheep in order that they make satisfactory gains in body weight. Where pastures do not provide sufficient cobalt, the deficiency can be corrected by inserting a small "bullet" of the metal in the sheep's stomach, where it slowly dissolves and is absorbed into the body.

The graph below shows the masses of two sheep on cobalt-deficient pasture under different supplementary feeding programmes.



Sheep I was given a cobalt "bullet" when the experiment began. Sheep II did not receive one until week 30.

The results support the hypothesis that

A. sheep with adequate cobalt in their diet increase their mass.
B. sheep lacking cobalt reach a minimum mass after 30 weeks.
C. absence of cobalt results in death of sheep within 40 weeks.
D. sheep require cobalt supplements in order to survive.

A.3

076

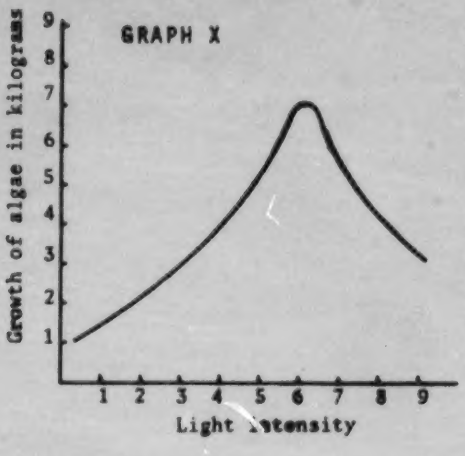
To determine the effect of the experimental variable, the scientists must examine

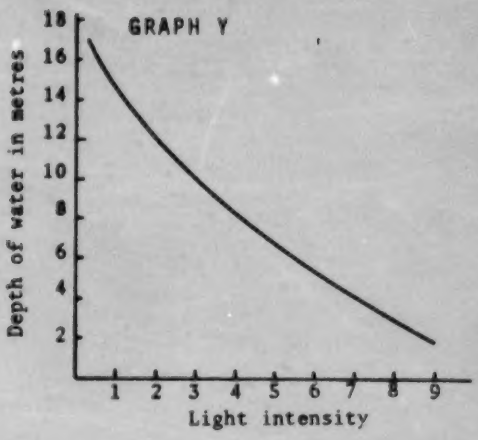
A. graph XVW.
B. graph XYZ.
C. graphs XV and XY.
D. graphs VW and YZ.

C.3

077

Look at the graphs below.





Graph X shows the amount that algae plants have grown (measured by weight) at different light intensities. Graph Y shows how light intensity changes with depth of water.

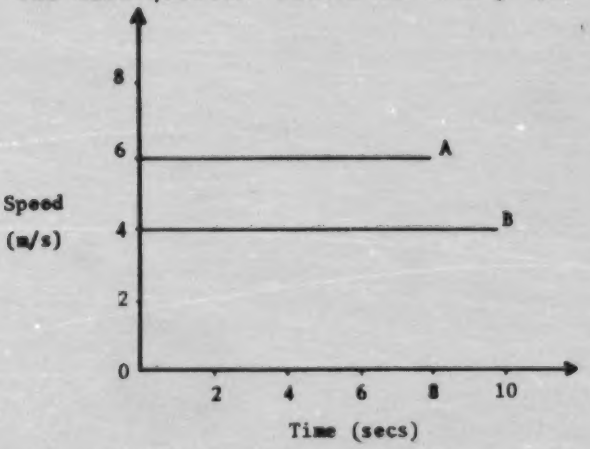
At what depth would these plants grow best?

A. 2 metres.
B. 4 metres.
C. 6 metres.
D. 8 metres.

C.2

078

The next question refers to this graph.



The graph shows the speeds of two objects A and B for a certain period of time. From the graph we know that

A. B has travelled further than A.
B. both objects are standing still.
C. A stops two seconds before B.
D. A is moving faster than B.

D.1

079

The next four questions refer to the table below.

METHOD	FUNCTION
Filtration	Separates undissolved substances from liquids.
Evaporation	Separates dissolved substances from solution.
Distillation	Separates liquids from dissolved solids.
Crystallization	Separates pure solids from a mixture of dissolved solids.

The method you would use to clear muddy water is

A. filtration.
B. evaporation.
C. distillation.
D. crystallization.

A.3

080

During an experiment a student accidentally dissolved the wrong substance in water. As he needed to use this substance later in the experiment he needed to recover it from the solution. The method he would use is

A. filtration.
B. evaporation.
C. distillation.
D. crystallization.

B.3

081

Copper sulphate, when dissolved in water, forms a blue-coloured solution. The method needed to obtain clear water from the copper sulphate solution is

A. filtration.
B. evaporation.
C. distillation.
D. crystallization.

C.2

082

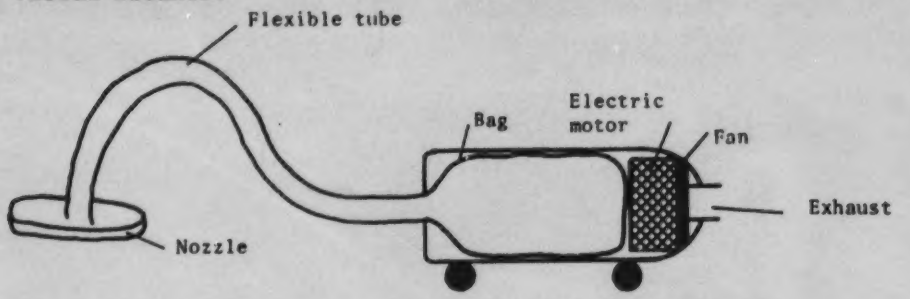
Table salt, sodium chloride, is one of the many salts dissolved in sea water.
The method necessary to separate the sodium chloride from the sea water and the other salts present are

A. filtration and evaporation.
B. evaporation and crystallization.
C. distillation and evaporation.
D. crystallization and filtration.

B.2

083

This question refers to this simple diagram of a vacuum cleaner.

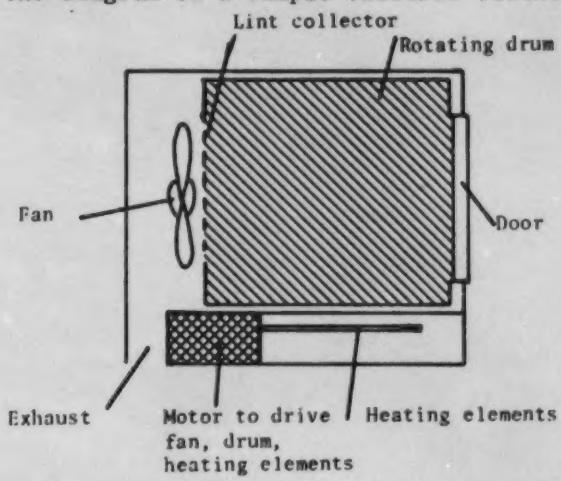


Which part of a vacuum cleaner works in a similar way to the filter paper in a filtration experiment?

A. Nozzle.
B. Flexible tube.
C. Bag.
D. Exhaust.

C.3 084

Consider the diagram of a simple electric clothes dryer.



Which section of the dryer shown above acts similarly to the filter paper in a filtration experiment?

A. Exhaust.
B. Rotating drum.
C. Heating element.
D. Lint collector.

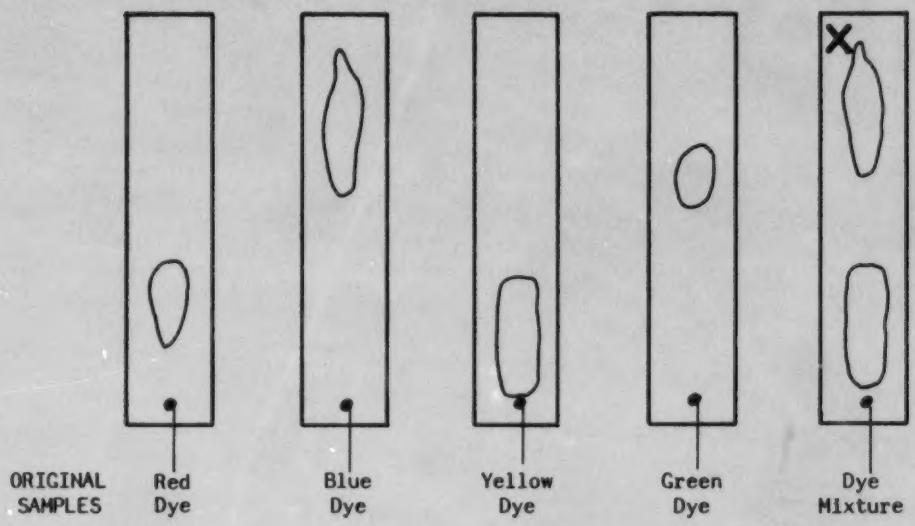
D.5 085

All acids contain the element

A. oxygen.
B. hydrogen.
C. nitrogen.
D. sulphur.

B.2 086

It is possible to separate coloured dyes by placing them on strips of absorbent paper. The paper is then soaked in a liquid and different dyes move at different speeds along the paper.
Below are five such pieces of paper on which a student has placed a small sample of different dyes. A strip that he forgot to label is marked X.



The colours mixed in the dye on X would be

A. red and green.
B. blue and yellow.
C. red and yellow.
D. blue and green.

B5. 087

Some acid was added to each of the four substances:

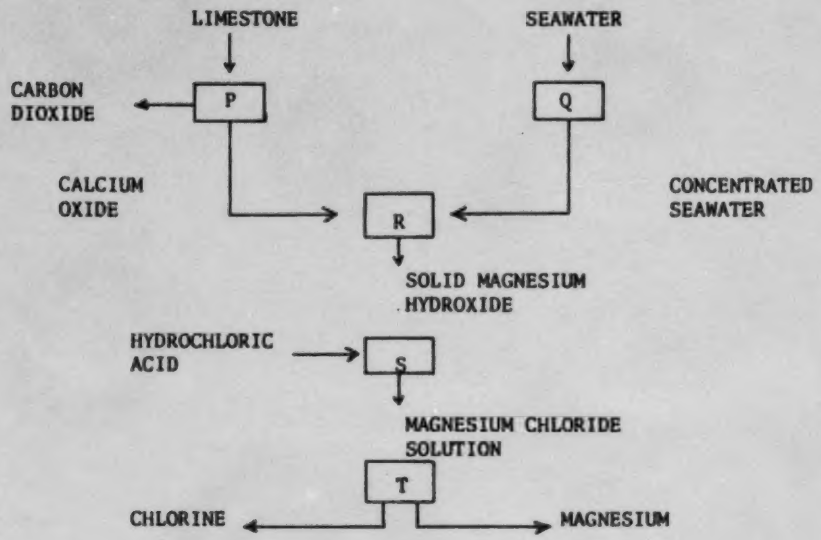
I. Calcium carbonate.
II. Marble chips.
III. The mineral calcite.
IV. Crushed shell fragments.

All FOUR reacted quickly and produced carbon dioxide gas. This indicates that all FOUR substances must contain

A. carbon.
B. calcium.
C. chlorine.
D. hydrogen.

A2. 088

The diagram below contains the information for the next three questions.



This flow diagram shows one of the industrial processes used to extract magnesium metal from seawater. The letters P, Q, R, S and T refer to changes that occur.
This is not one of the processes that you have studied. You are expected to use the knowledge gained during your study of other processes to answer these questions.

Which change would be a precipitation reaction?

A. P.
B. Q.
C. R.
D. S.

C.2 089

In which change would an acid-base reaction occur?

A. P.
B. R.
C. S.
D. T.

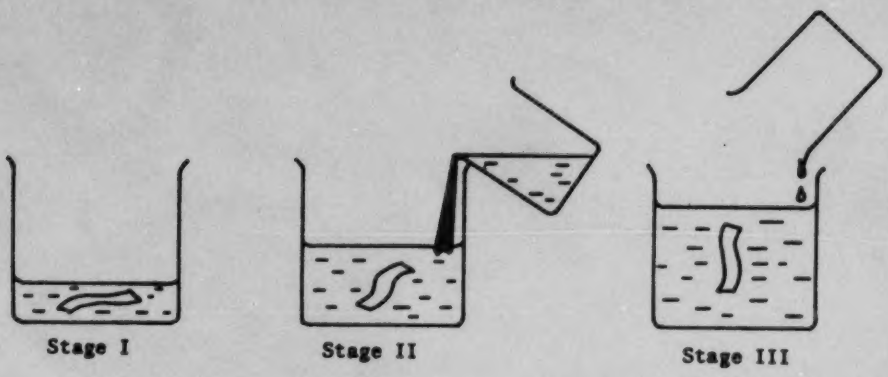
C.3 090

Which change would use electrolysis?

A. P.
B. Q.
C. S.
D. T.

D.3 091

The next question refers to the diagrams below.



1. The diagrams show three stages in adding solution Y to solution X. A student adds a piece of RED litmus paper to solution X at stage I and notes the results:

Stage I	Stage II	Stage III
RED	RED	BLUE

If the student were to repeat the experiment but adding a piece of BLUE litmus paper at stage I, the correct sequence of colour changes would be

	STAGE I	STAGE II	STAGE III
A	BLUE	BLUE	RED
B	BLUE	RED	RED
C	RED	BLUE	BLUE
D	RED	RED	BLUE

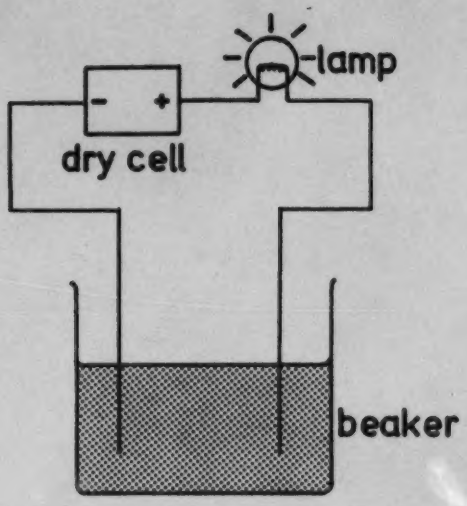
D1. 001692 092

A powder that is mixed with water to make fizzy drinks contains potassium bicarbonate $KHCO_3$ and citric acid $C_6H_8O_7$. The gas which bubbles out when you mix the powder with water is most likely to be

A. hydrogen sulphide H_2S
B. hydrogen chloride HCl
C. nitrogen dioxide NO_2
D. carbon dioxide CO_2

D4. 093

The next question refers to this diagram.



Because the lamp is glowing the liquid in the beaker is most probably

A. pure water.
B. kerosene.
C. sugar solution.
D. acid solution.

D.3 094

A solution containing only potassium nitrate and water can be made by adding together solutions of

A. potassium hydroxide and nitric acid.
B. potassium sulphate and nitric acid.
C. potassium carbonate and sodium sulphate.
D. potassium chloride and nitric acid.

A.3 094

A glowing match was dropped into a dry gas jar containing one gas only. The match (but NOT the gas) caught alight. The gas in the jar was most likely

A. carbon monoxide.
B. hydrogen.
C. oxygen.
D. propane.

C.3 096

An aqueous solution of sodium chloride is evaporated to half its original volume. The concentration of the sodium chloride solution has

A. doubled.
B. halved.
C. remained the same.
I. decreased by an unknown amount.

A.2 097

If a metal is described as <u>ductile</u> it means that the metal

A. is hard.
B. has a high density.
C. can be rolled into thin sheets.
D. can be drawn out into wires.

D.1 098

A mixture is composed of 3 substances, X, Y, Z.
X is a liquid of boiling point 100°C, density 1.0 g cm^{-3}
Y is a liquid of boiling point 65°C, density 0.8 g cm^{-3}
Z is a solid of boiling point 1300°C, density 2.0 g cm^{-3}
X and Y are miscible with each other.
Z is freely soluble in both X and Y.
In attempting to isolate X, Y, Z from each other the <u>first</u> step would be to

A. filter the mixture to remove Z.
B. pass the mixture through a narrow based flask to remove the lighter Y by flotation.
C. boil the mixture at 100°C and collect X and Y vapour.
D. boil the mixture at 65°C and collect Y vapour.

D.1 099

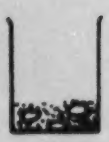
A common laboratory experiment is to use a blowpipe to heat lead oxide on a charcoal block. After a short time a ball of lead forms on the block.

This experiment is similar to the way in which

A. iron is separated from iron ore.
B. aluminium is obtained from bauxite.
C. impure copper is made pure.
D. iron is converted into steel.

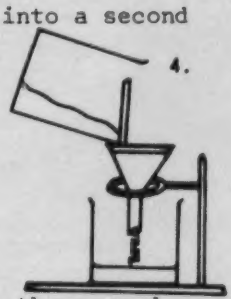
A.1 100

A student mixed some blue copper sulphate crystals and some sand in a beaker.



Then he added some water and stirred vigorously.

Then he poured the contents of the beaker into a second beaker through a filter paper in a funnel.



Which of these should he expect to find in the second beaker?

A. Sand.
B. A clear blue solution.
C. Blue crystals.
D. Pure water.

B.3 101

Three processes used in the chemical separation of a metal from its ore are

1. Reduction - of the metal ore to a metal e.g. by heating with carbon.
2. Concentration - separating the ore from unwanted material e.g. dirt.
3. Refining - purifying the metal.

The order in which these processes are used is

A. 1, 2, 3.
B. 2, 3, 1.
C. 3, 1, 2.
D. 2, 1, 3.

D.3 102

The list below is of four chemical reactions which you would have seen in the laboratory.

P. Burning magnesium.
Q. Decomposing water with electricity.
R. Combining iron and sulphur.
S. Heating mercury oxide.

Remembering that endothermic reactions require energy to keep them going, then the two endothermic reactions are

A. P and R.
B. Q and S.
C. P and S.
D. Q and R.

B.1

103

Heating red mercury oxide causes it to form mercury and oxygen.

Such a reaction can be classed as

A. exothermic.
B. precipitation.
C. synthesis.
D. decomposition.

D.2

104

This is a test for the presence of silver in a solution:

I. dissolve some common salt in water.
II. add salt solution to test solution.

A positive test for silver results in the formation of a thick, white cloud of silver chloride. If this is left to stand it settles to the bottom of the test-tube.

Such a reaction is called

A. exothermic.
B. endothermic.
C. precipitation.
D. synthesis.

C.2

105

The solubility of potassium nitrate is
40 g per 100 g of water at 20°C

50 g of potassium nitrate was added to a beaker containing 100 g of water at 20°C and stirred until the solution was saturated. The mass of undissolved potassium nitrate at 20°C is

A. 10 g.
B. 20 g.
C. 30 g.
D. 40 g.

A.3 106

The naturally occurring substances from which many metals can be chemically extracted are called

A. alloys.
B. elements.
C. ores.
D. sedimentary rocks.

C.3 107

Which one of these terms most accurately describes a liquid which extracts the red colouring matter from rose petals?

A. Solute.
B. Solution.
C. Solvent.
D. Saturated solution.

C.3 108

Many chemical reactions occurring in excess water solutions will proceed more slowly if further water is added. The factor causing this would be

A. a change in temperature.
B. a change in the concentration of the reactants.
C. the nature of the substances.
D. a change in the surface area exposed.

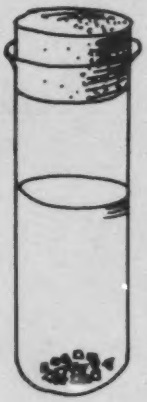
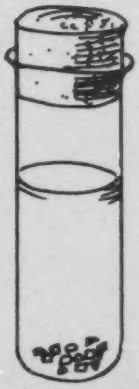
B.3 109

Which one of the following four solutions of a salt in water is the most concentrated?

A. 11 g of salt dissolved in 10 cm^3 of water.
B. 9 g of salt dissolved in 10 cm^3 of water.
C. 7 g of salt dissolved in 5 cm^3 of water.
D. 5 g of salt dissolved in 5 cm^3 of water.

C.3 110

Observe the diagrams of the following four test tubes which show an experiment used to determine the time taken for equal quantities of crystals to dissolve.

			
coarse crystals	fine crystals	fine crystals	fine crystals
tube shaken	tube shaken	tube allowed to stand	tube shaken and heated
2 minutes	30 seconds	2 hours	10 seconds

Using the information presented decide which one of the following four statements most surely reflects the results.

A. Coarse crystals dissolve quickly because of a large surface area.

B. Finely ground crystals will dissolve quickest if the tube is shaken and heated.

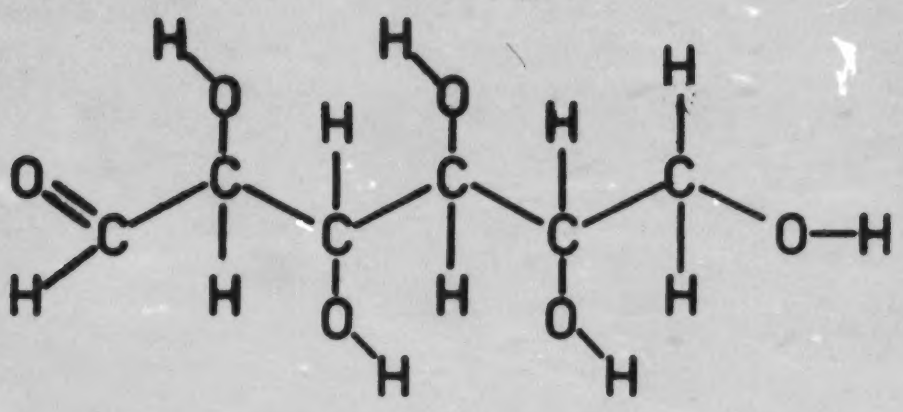
C. Shaking a tube makes little difference to the rate at which crystals dissolve.

D. Fine crystals dissolve slowly because of their reduced surface area.

B.4

111

A molecule of glucose can be represented like this:



Each O, C, H represents one atom of oxygen, carbon and hydrogen respectively. The number of atoms of each element in one molecule of glucose is

A. one oxygen, one hydrogen and one carbon.
B. five oxygen, seven hydrogen and six carbon.
C. six oxygen, twelve hydrogen and six carbon.
D. six oxygen, six hydrogen and six carbon.

C.4 112

The numbers of protons, neutrons, and electrons of four atoms, J, K, L and M, are given below:

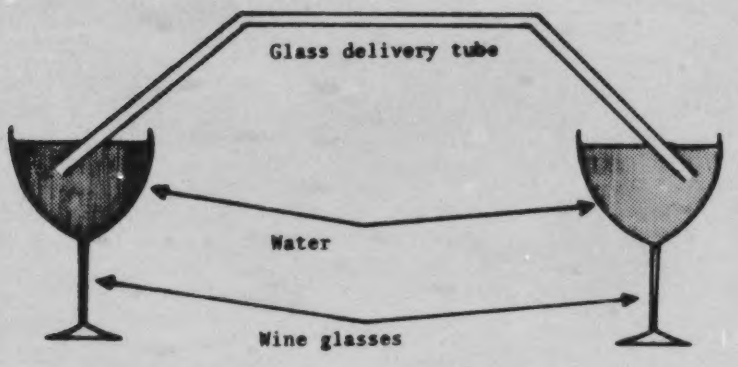
atom J has 6 protons, 7 neutrons and 6 electrons,
atom K has 6 protons, 8 neutrons and 6 electrons,
atom L has 7 protons, 8 neutrons and 7 electrons,
atom M has 8 protons, 7 neutrons and 8 electrons.

Which one of these pairs of atoms comprises isotopes of the same element?

A. J and K.
B. K and L.
C. J and M.
D. L and M.

A.4 113

The following simple apparatus was used by Cavendish in one of his experiments.



He placed air and oxygen in the bent delivery tube and subjected it to electric sparks. The water rose in the tube to almost completely fill it.

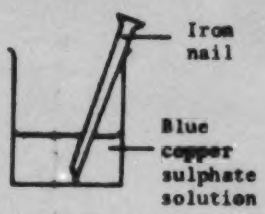
Knowing that -

a) Oxygen + Nitrogen → Nitrogen dioxide
b) Electrical sparks will cause oxygen and nitrogen to combine.
c) Nitrogen dioxide is soluble in water.

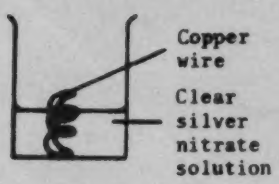
Which of the following conclusions could Cavendish best make from his observations?

A. Air is made up almost entirely of oxygen and some other gas which react with each other to form another gas which is soluble in water.
B. Oxygen will combine with some part of the air when subjected to a spark to produce a gas which is soluble in water.
C. Oxygen will combine with some part of the air to form a gas which exerts a pressure and causes the water to rise in a tube.
D. Electric sparks cause all gases to combine.

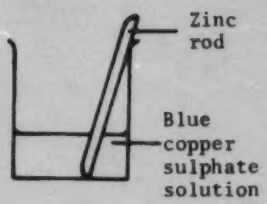
The next 2 questions refer to the following evidence.



Copper coating forms on nail : solution turns green



Silver coating forms on wire : solution turns blue



Copper coating forms on rod : solution turns clear

A group of students have drawn up tables of activity of metals, going from the most active to the least active. Which of the following answers is nearest to correct?

A. Silver : Copper : Zinc : Iron.
B. Iron : Copper : Silver : Zinc.
C. Iron : Zinc : Copper : Silver.
D. Iron : Copper : Zinc : Silver.

C.1 115

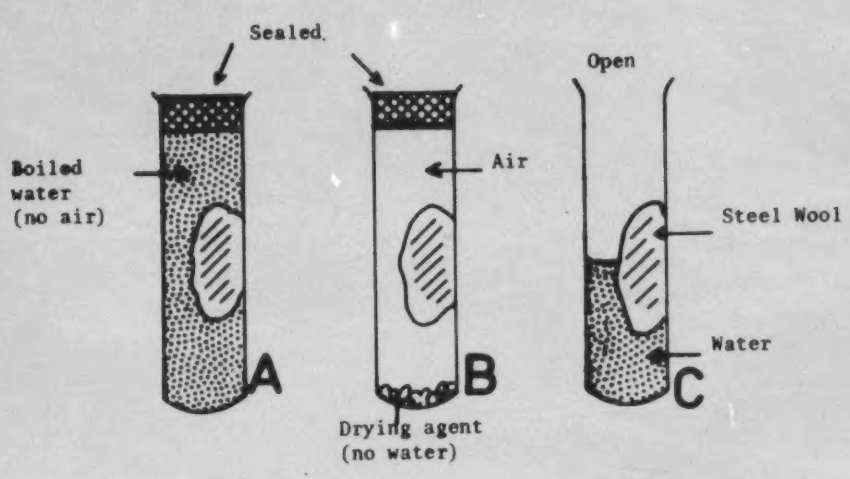
The students decided to do another experiment in order to work out the whole list correctly. Which of the following experiments would allow the students to do this?

A. Silver wire in copper sulphate solution.
B. Zinc rod in iron (II) sulphate solution.
C. Copper wire in zinc sulphate solution.
D. Copper wire in iron (II) sulphate solution.

B.1 116

The test tubes drawn below show the set-up of an experiment to study rusting.

It was noticed that the steel wool in tube C rusted while that in tubes A and B did not.



From this experiment you could conclude that

A. only air is necessary for rusting.
B. steel wool will rust in the presence of air and water.
C. substances will rust if water is present.
D. steel wool and water combine to form rust.

B.4

117

If solid carbon dioxide (known as "dry ice") is placed in a beaker of water, bubbles are seen rising from the water and white vapours spill out of the beaker and over the desk.

The correct explanation for this effect is

A. the "dry ice" causes the water to boil.
B. the "dry ice" decomposes the water.
C. the water causes the "dry ice" to vaporise.
D. the water decomposes the "dry ice".

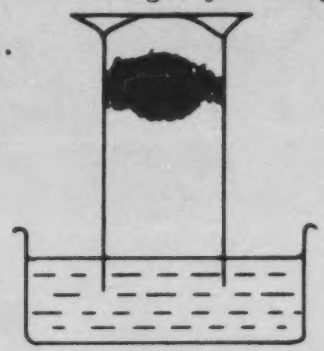
C.3

118

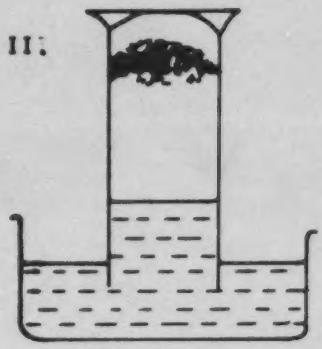
The following experiment was carried out in a school laboratory.

Steel wool was placed into a gas jar which was placed over water (diagram I). After two weeks it was noted that the steel wool had rusted and that the water level had risen in the gas jar (diagram II).

I.

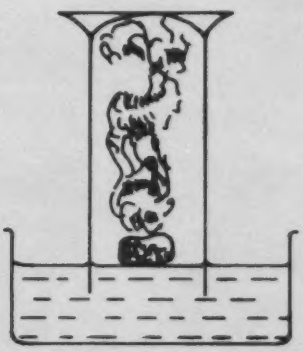


II.

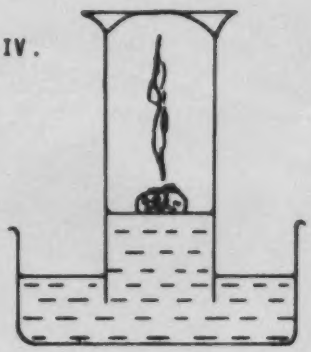


Some phosphorus was placed on a cork in a similar gas jar. The phosphorus was then ignited (diagram III). As the phosphorus burned the water rose into the gas jar. When the phosphorus stopped burning (diagram IV) it was noted that the water level was the same as previously noted with the steel wool.

III.



IV.



The similarity of the water levels would lead us to say that

A. air has leaked through the water into the gas jar.
B. the same thing in the air which is necessary for rusting is necessary for burning.
C. oxygen has escaped from the jar through the water.
D. carbon dioxide is produced by both of these experiments because each one involves burning.

The time taken for half the atoms in a radioactive sample of uranium to decay is called the half-life and is 4,500 million years.

Scientists use this information to

A. predict the ages of some rocks.
B. build better nuclear reactors.
C. determine the age of trees.
D. make bigger atomic weapons.

A.3 120

The breaking down of rocks into smaller particles is called weathering. If chemical changes occur in this process, we call it chemical weathering; if no chemical changes occur we call it physical weathering.

Which of the following is an example of chemical weathering?

A. Water freezing inside cracks in rocks causing them to break.
B. Dissolving of limestone by water containing dissolved carbon dioxide.
C. Wind-carried dust and sand cutting out honeycomb shapes in sandstone.
D. Hot days and cold nights causing layers to split off granite boulders.

B.4 121

The next two questions refer to the following information.

The course of a river can be divided into three parts
1. young stream, in the headwater or mountain range.
2. mature stream, in the middle region of its course.
3. old stream, where the river is flowing into a sea or lake.

In which region/s will steep V-shaped valleys occur?

A. 1 only. B. 2 only. C. 3 only. D. 1,2 or 3.

A.3 122

In which region/s will delta formations occur?

A. 1 only. B. 2 only. C. 3 only. D. 1,2 or 3.

C.3 123

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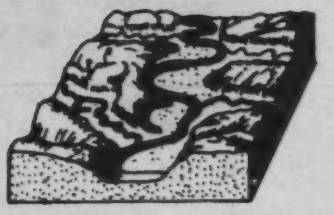
1. 

2.

3.

4.

The diagrams show four stages in the erosion caused by a river.
Which order below is correct in time sequence from earliest to latest?

A. 4, 3, 1, 2
B. 3, 1, 4, 2
C. 2, 3, 1, 4
D. 2, 1, 3, 4

C.3

124

Four white minerals were tested for hardness by scratching them with a copper coin of hardness 4.
All four specimens were easily scratched by the coin.
A conclusion which could be drawn from this is that

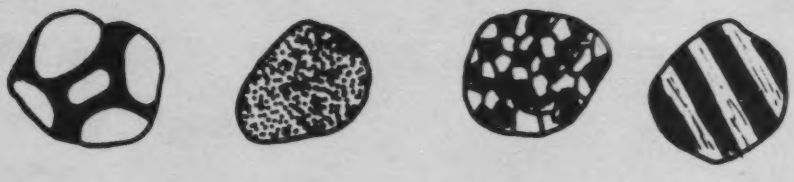
A. most white minerals can be scratched by a copper coin.
B. minerals with hardness 5 will not be scratched by a copper coin.
C. the four minerals tested have a hardness of 4.
D. these minerals are softer than a copper coin.

D.3

125

Which diagram below best represents the sedimentary rock, sandstone, as drawn by a student, after observing the sandstone with the unaided eye?

A. B. C. D.



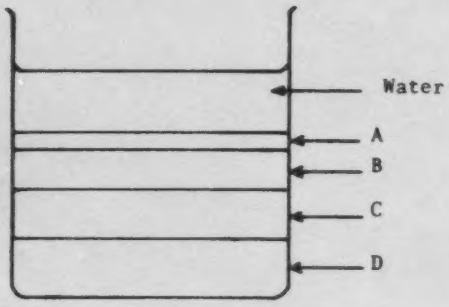
B.4 126

Which of the diagrams below could best represent a sedimentary rock called conglomerate?

A. B. C. D.

A.3 127

A student thoroughly stirred particles of different sizes in a beaker of water and then let the mixture settle. The result is shown in the diagram.

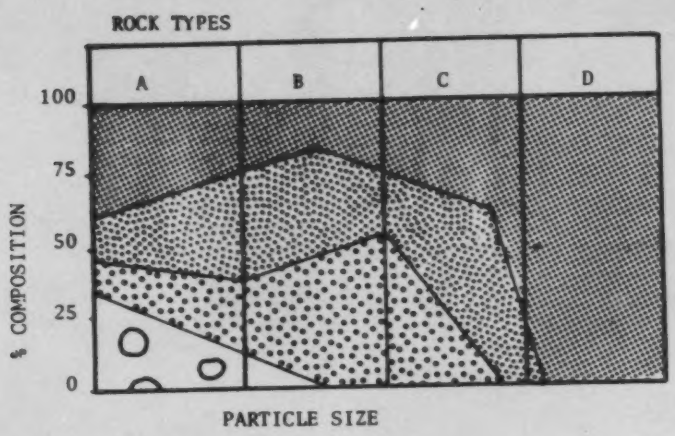


The smallest particles would be found in the layer marked

A. A B. B C. C D. D

A.4 128

The next two questions refer to this information.



KEY

Very fine particles

Sandy particles

Medium particles

Large particles

Which of the rock types, A, B, C or D would best suit a sedimentary rock which was composed of 20% very fine particles, 30% sandy particles and 50% medium particles?

B.3

129

Which rock type best could be named a siltstone?

A. A B. B C. C D. D

D.3

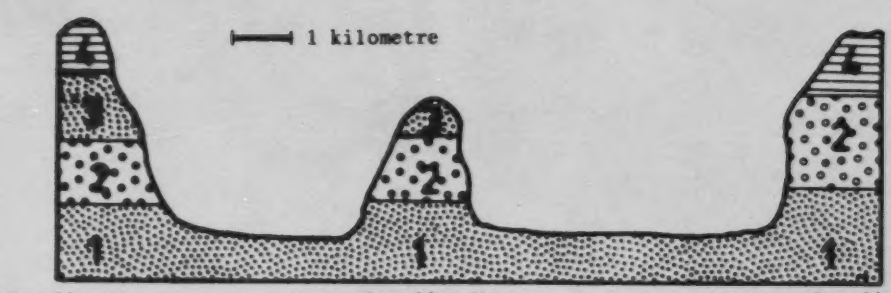
130

The processes by which sediments can be converted to sedimentary rocks are

A. weathering and erosion.
B. cementation and erosion.
C. pressure and weathering.
D. cementation and compaction.

D.3

This question refers to this geological cross-section.



Rock type 3 does not appear at locality Z but it does at X and Y.
Several reasons for this have been stated -

I. Locality Z is too far from X and Y for the right conditions to form rock 3.

II. Rock 3 was eroded from locality Z before rock 4 was formed.

III. Rock 2 has formed thicker beds at locality Z so it was too high up to get rock 3 on top of it.

Which reasons are most likely to explain rock 3's absence from locality Z?

A. I only.
B. II only.
C. I and III only.
D. II and III only.

B.1

132

Old rock layers are tilted, folded and faulted by crustal movements and then eroded; at a later time younger rocks are laid down on top of this structure.
The line between the old and young rock is called

A. a fault.
B. an anticline.
C. a syncline.
D. an unconformity.

D.1

133

Many weathered rocks and soils are red or brown. This is due to the presence, in the original rock, of

A. iron. B. quartz. C. mica. D. oxygen.

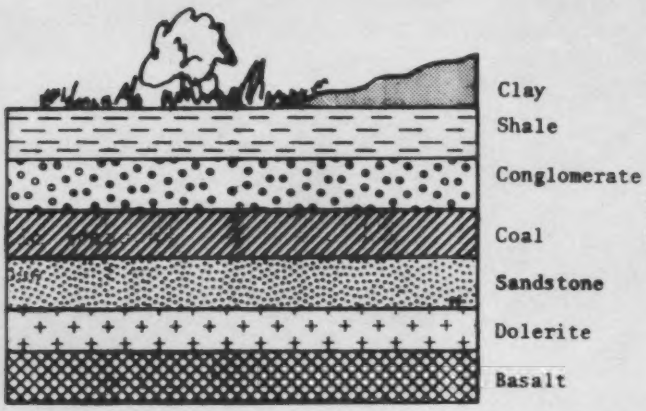
A.3 134

A geology student has four samples of rock. His teacher told him that one of them was formed under very calm water. Which of these four rocks would that be?

A. Coarse conglomerate.
B. Fine conglomerate.
C. Sandstone.
D. Shale.

D.2 135

The next question refers to this diagram.



The diagram shows layers of rock exposed on a cliff face. The oldest sedimentary rock shown is most probably

A. basalt. C. sandstone.
B. clay. D. shale.

C.1 136

Which of the following is LEAST likely to be a feature of sedimentary rocks?

A. Broken or rounded particles.
B. Particles sorted into layers.
C. The presence of large crystals.
D. The presence of fossils.

C.3 137

The next two questions refer to the following information.

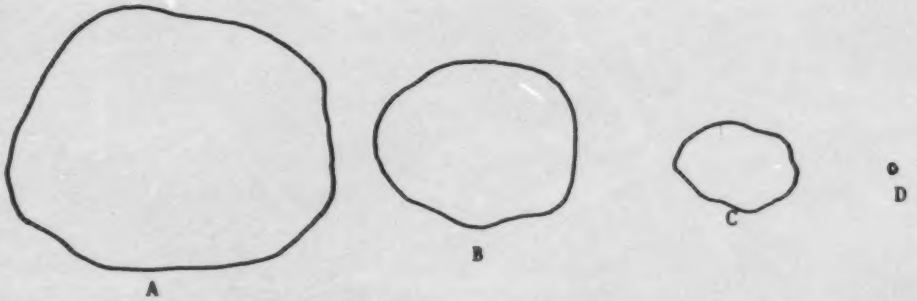
NAME OF PARTICLE	SIZE OF PARTICLE (mm)	ROCK FORMED FROM PARTICLE
BOULDER	> 256	COARSE CONGLOMERATE
COBBLE	64 to 256	MEDIUM CONGLOMERATE
PEBBLE	2 to 64	FINE CONGLOMERATE
SAND	1/16 to 2	SANDSTONE

This particle would, when compacted with many others of similar size, form which rock?

A. Coarse conglomerate.
B. Medium conglomerate.
C. Fine conglomerate.
D. Sandstone.

C.2 138

Which sized rock particle drawn below would form sandstone when compacted together.



D.3 139

The next two questions refer to the information below.

Four soils were tested to determine the amount of water which

a) stayed on the surface.
b) stayed in the soil.
c) passed through the soil.

The results, expressed as percentages were as follows:

	SOIL A	SOIL B	SOIL C	SOIL D
% staying on surface	100	50	10	20
% staying in soil	0	5	20	0
% passing through	0	45	70	80

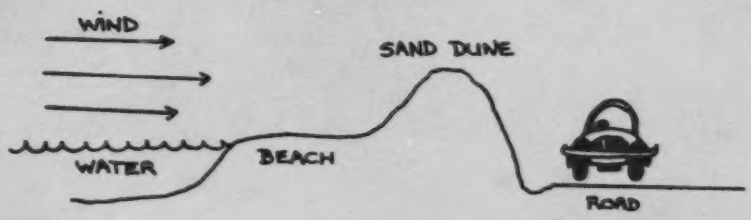
Which soil (A,B,C or D) is probably most suitable for plant growth?

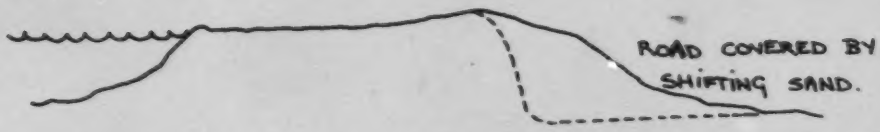
C.4 140

Which soil (A,B,C or D) would contain the greatest amount of clay?

A.3 141

Sand dunes along some beaches often "shift" as wind blows them slowly inland, as shown by the diagrams below.





Which solution shown below would be best to use to solve this sort of problem?

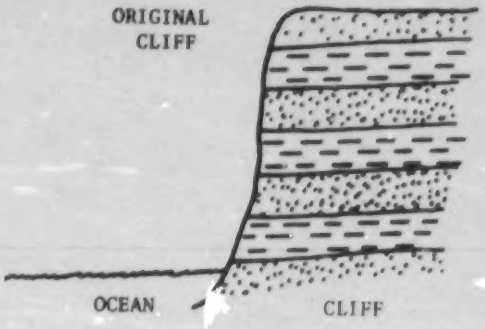
A. Build a wall to stop the sand.

B. Build a wind break to shelter the dune.

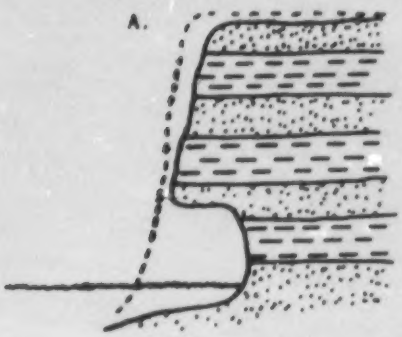
C. Plant grass on the dune.

D. Keep the sand moist to stop it blowing away.

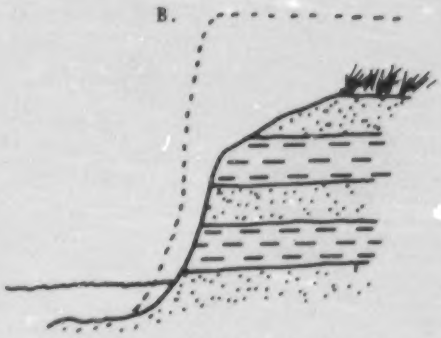
It is known that some sedimentary rocks weather more quickly than others. On the basis of this information which diagram below best represents the possible appearance of the cliff (drawn right) after a long period of weathering?



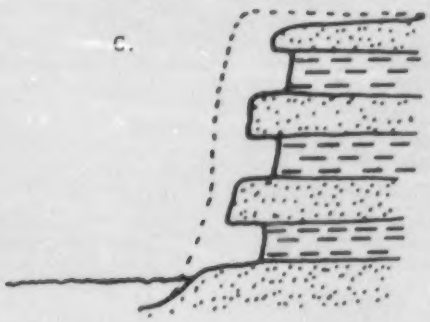
A.



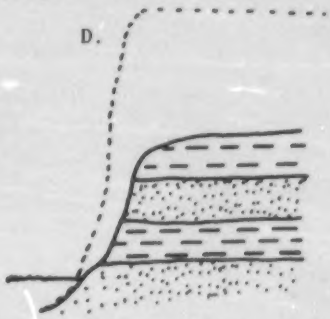
B.



C.



D.



C.1

143

A mineral specimen has the following properties:

Colour : grey
Streak : grey
Lustre : metallic
Specific gravity : 7.4
Crystal shape : cubic

The mineral is probably

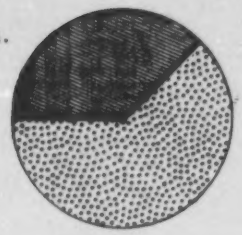
A. quartz.
B. galena.
C. calcite.
D. haematite.

B.1

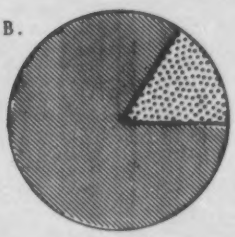
144

Which of the graphs below shows the composition of sandstone as 80% sand particles cemented together with 20% clay?

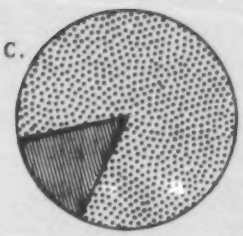
A.



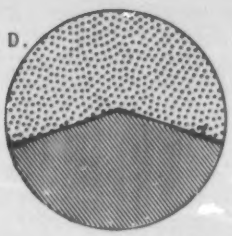
B.



C.



D.



C.4

145

The specific gravity of a mineral is its weight relative to water.
Geology textbooks give the value of the specific gravity of quartz as 2.65 (an exact value). For the mineral feldspar, the value is quoted as a range: 2.56 to 2.74. The best reason for this is that

A. not all feldspars are the same.
B. it is difficult to measure the specific gravity of feldspars accurately.
C. the specific gravity of quartz has been measured once only.
D. feldspars have different colours.

A.3

146

A geologist has made these field notes about a stratum (bed) of sedimentary rock:

"Sandstone with very clear ripple marks, cross-bedded, several marine fossils present".

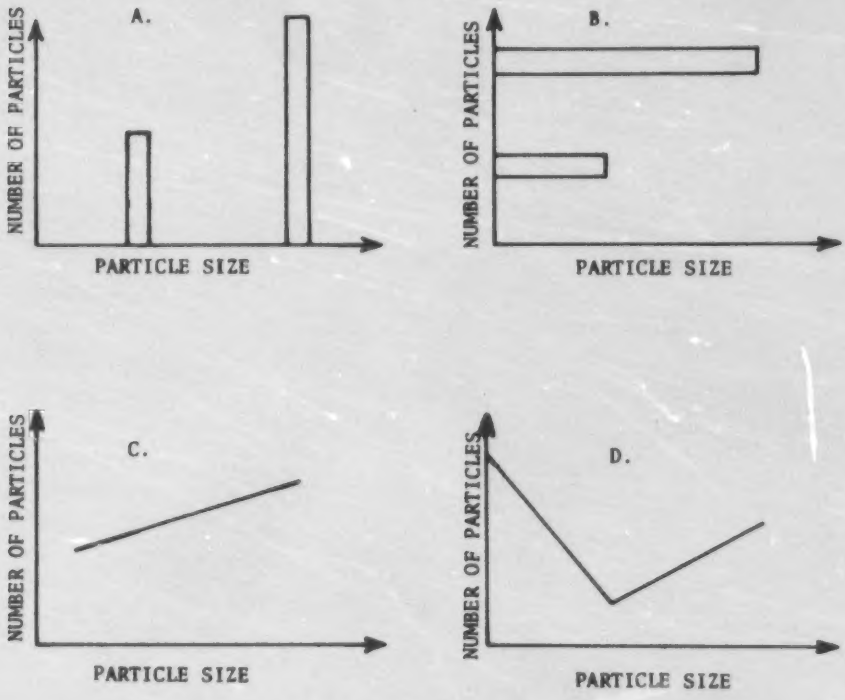
The evidence available in the notes indicates that this sandstone was laid down in a region where

A. there was a large tidal range.
B. the water was quite shallow.
C. the water was very deep .
D. winds blew sand into a salt lake.

B.2 147

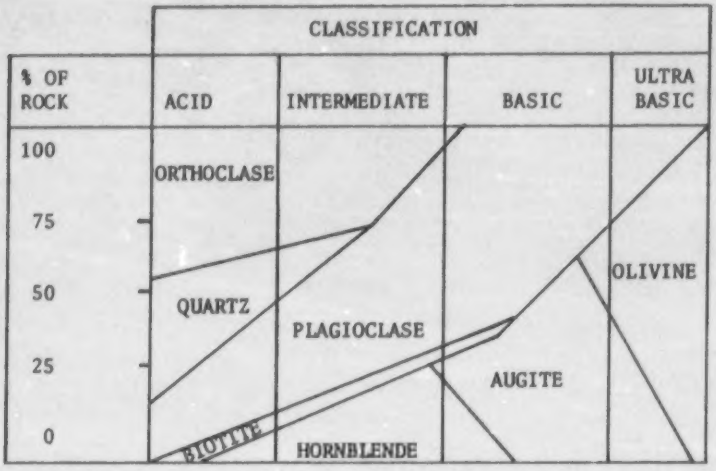
Sandstone consists of particles of sand cemented together with a finer clay type material.

Which graph below most probably represents sandstone?



A.4 148

The next two questions refer to the diagram below.



A rock which contained mainly Orthoclase and Plagioclase and Hornblende with a small amount of Biotite would be classified as

A. Acid.
B. Intermediate.
C. Basic.
D. Ultrabasic.

B.3

149

Given these as the common igneous rock forming minerals, the most common mineral found in igneous rocks is

A. Orthoclase.
B. Quartz.
C. Plagioclase.
D. Hornblende.

C.1

150

When molten rock cools crystals of minerals form. The deeper the molten rock is inside the earth's crust, the slower the cooling and the larger the crystals.

Four rocks, which have formed from molten rock are described below:

OBSIDIAN - has glass-like surface.
GRANITE - has large crystals of quartz and feldspar.
BASALT - has small crystals.
PORPHYRY - larger crystals embedded in small crystals.

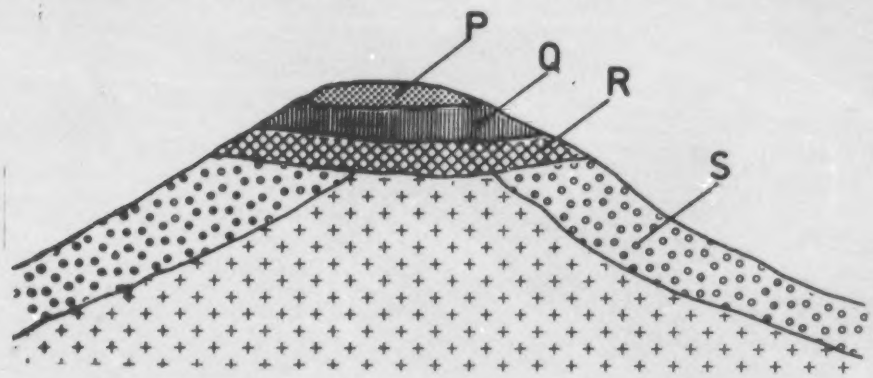
Of these rocks, the rock you would expect to be the slowest to cool is

A. porphyry.
B. granite.
C. basalt.
D. obsidian.

B.3

151

The next two questions refer to the following diagram which shows a geological cross-section of a hill.



In the above diagram the *boundary between beds* R *and* S represents

A. an anticline.
B. a block mountain.
C. an unconformity.
D. a monocline.

C.1

152

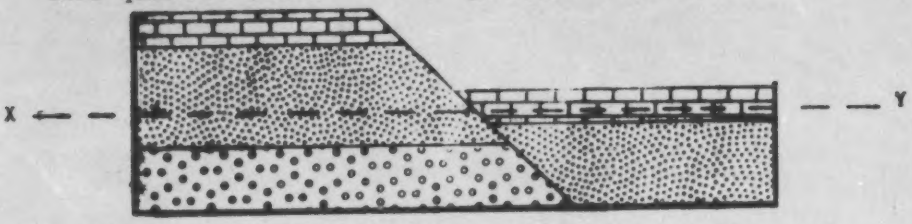
Of the four layers marked P, Q, R and S which would be the oldest?

A. P.
B. Q.
C. R.
D. S.

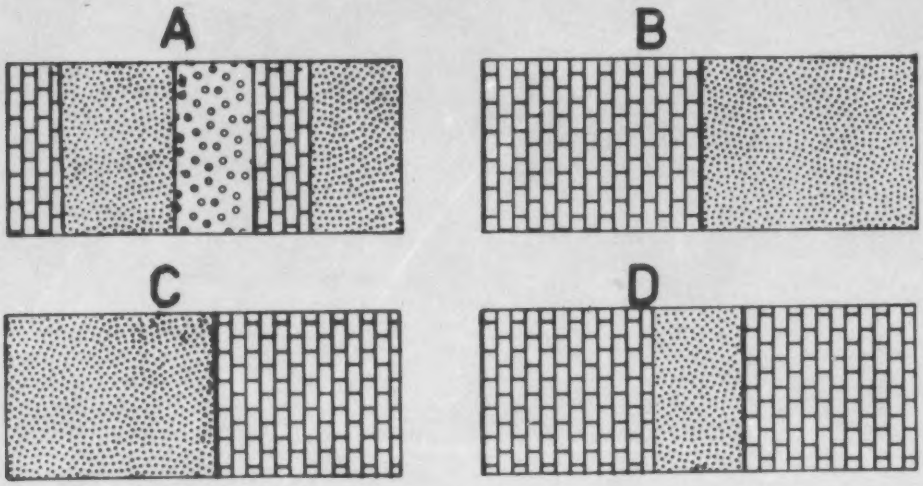
D.3

153

This question refers to this geological section.



If the fault drawn above were to be eroded until the surface of the land was level with XY, then the surface as viewed from above could look like -



C.3

154

A river can be divided into the following regions:

UPPER - has rapids, waterfalls, and narrow valley.
MIDDLE - river bends, wide valley, billabongs.
COASTAL - very broad plain, stream splits and forms islands.
DELTA - region in sea where sediments are deposited.

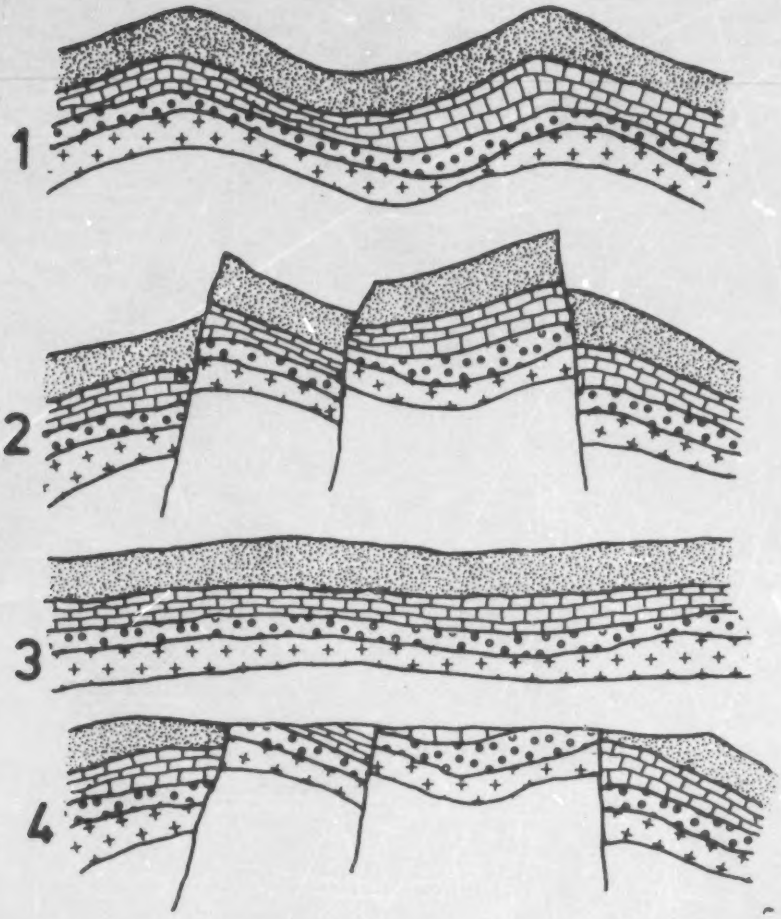
The region of a river which you would expect the most erosion to occur is

A. upper.
B. middle.
C. coastal.
D. delta.

A.3

159

The four cross sectional diagrams shown indicate four stages in the geological development of an area.



The correct sequence of events from earliest to most recent was most probably

A. 1, 2, 4, 3.
B. 3, 2, 4, 1.
C. 1, 3, 2, 4.
D. 3, 1, 2, 4.

D.4

156

Wind erosion of land surfaces is typical of

A. humid regions.
B. arid regions.
C. swamp regions.
D. lake regions.

B.3

157

Consider Moh's scale of hardness.

Hardness	Mineral	Hardness	Mineral
1	Talc	6	Orthoclase
2	Gypsum	7	Quartz
3	Calcite	8	Topaz
4	Fluorite	9	Corundum
5	Apatite	10	Diamond

A student examining a rock noticed that it contained a mineral X. He further noticed that the mineral could be scratched by quartz, but would not scratch orthoclase. Mineral X would scratch apatite and could be scratched by quartz. X is most likely to be

A. apatite.
B. orthoclase.
C. quartz.
D. topaz.

B.3 158

One of the properties used to classify minerals is their hardness. A mineral is said to be harder than a substance if it is able to scratch that substance.

The mineral, calcite, is able to scratch your fingernail but not a 2-cent coin. Quartz can scratch a 2-cent.

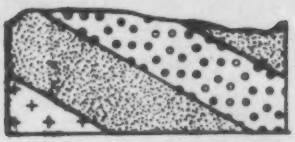
A list of these substances arranged in order of INCREASING hardness would be

A. quartz, coin, calcite, fingernail.
B. calcite, fingernail, quartz, coin.
C. coin, quartz, fingernail, calcite.
D. fingernail, calcite, coin, quartz.

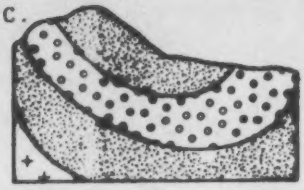
D.3 159

Look at the following rock sections all drawn to the same scale.

A.

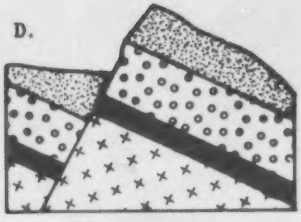


C.

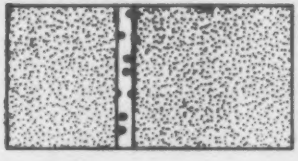


B.

D.

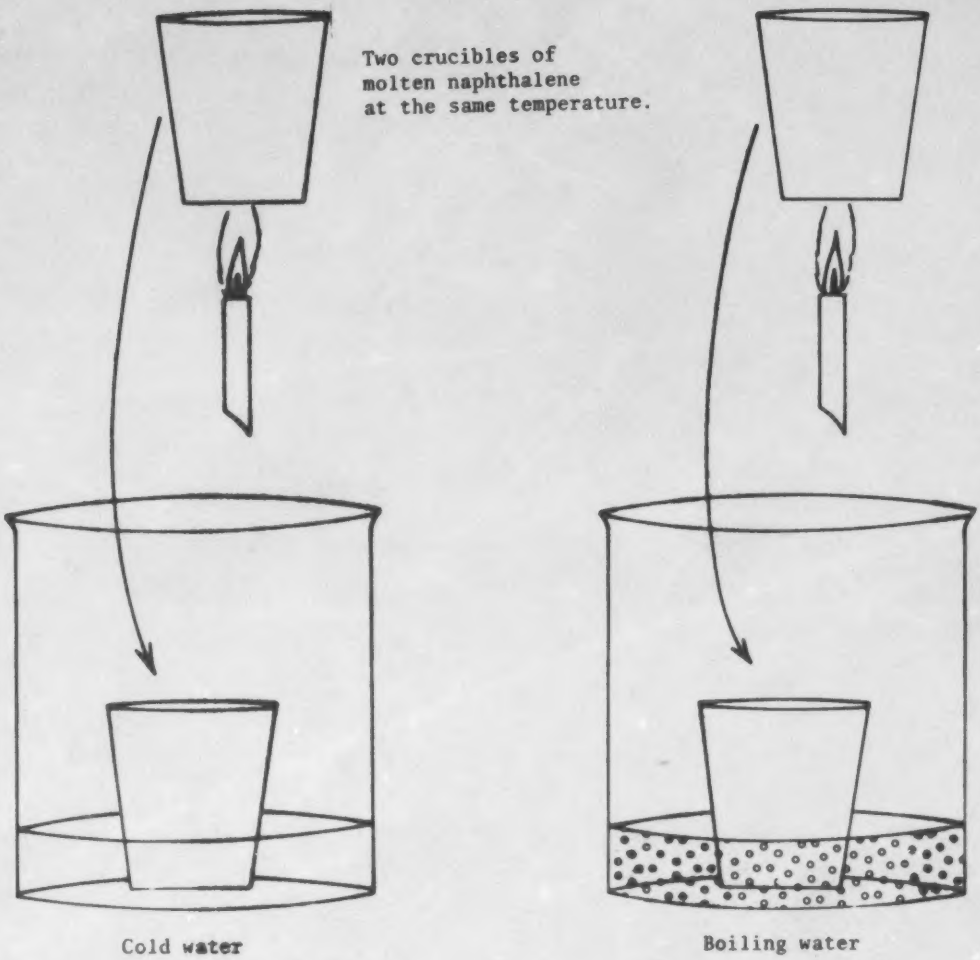


Which of the sections above (A,B,C or D) would look most like the diagram on the right if you looked down on it from above?



D.3

160



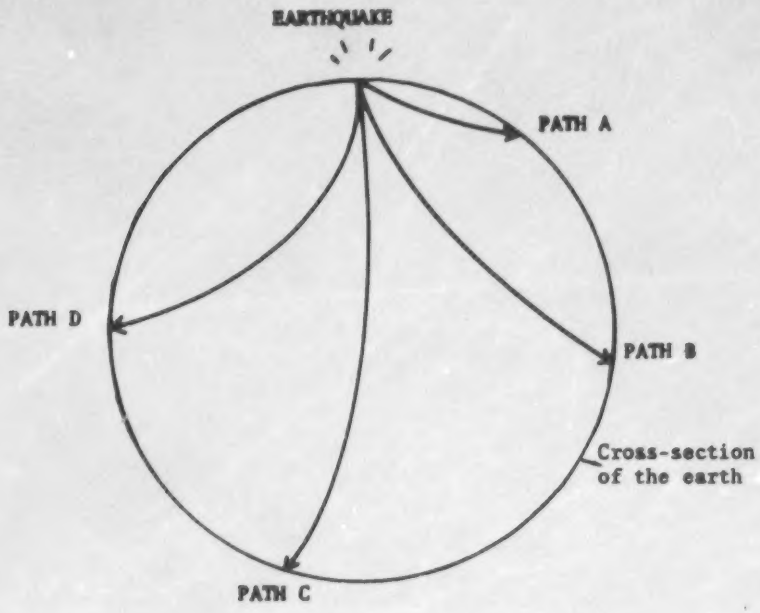
Two crucibles of molten naphthalene (moth balls) were separately cooled as shown above. In cold water the naphthalene formed a glassy solid whilst in boiling water the naphthalene formed large crystals. This experiment helps us understand why

A. sea water dries to form crystals of salt.
B. a crystal hung in its own solution will grow larger.
C. some igneous rocks have different size crystals.
D. water in a freezer forms crystals of ice.

C.1

1b1

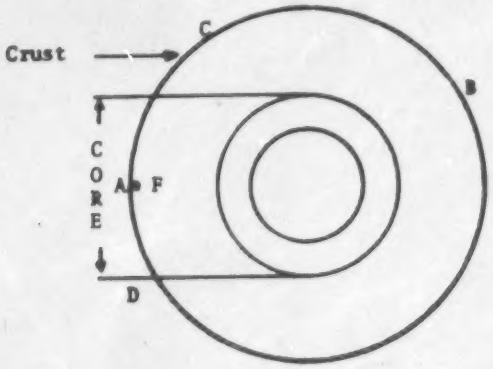
Some earthquake waves will NOT pass through liquids. Which of the paths drawn below could NOT be taken by these waves?



C.3

162

The diagram represents a cross-section of the earth. Earthquake waves are travelling out from F.

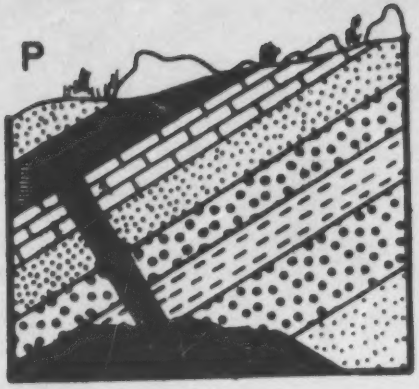


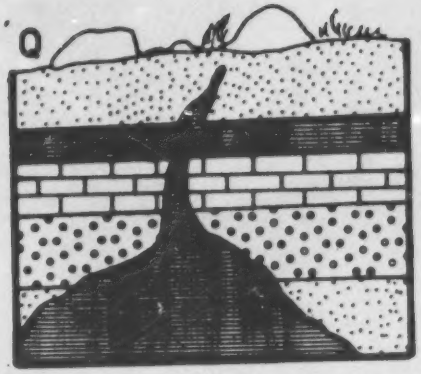
Knowing that S waves cannot travel through liquids we would NOT expect to detect S waves at

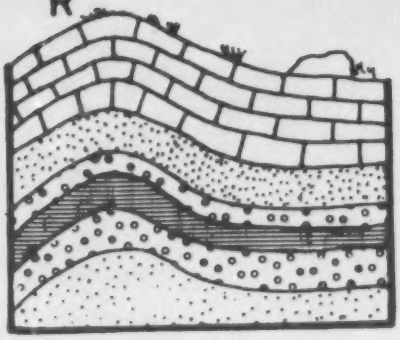
A. A.
B. B.
C. C.
D. D.

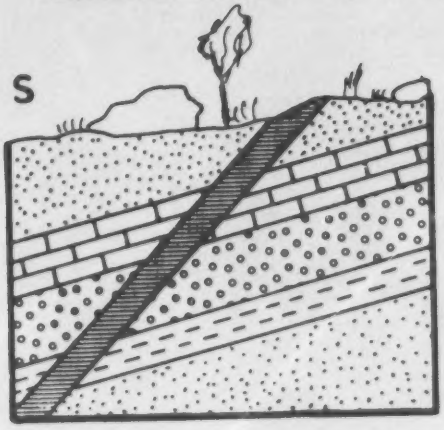
B.3

163

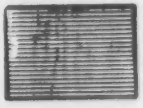






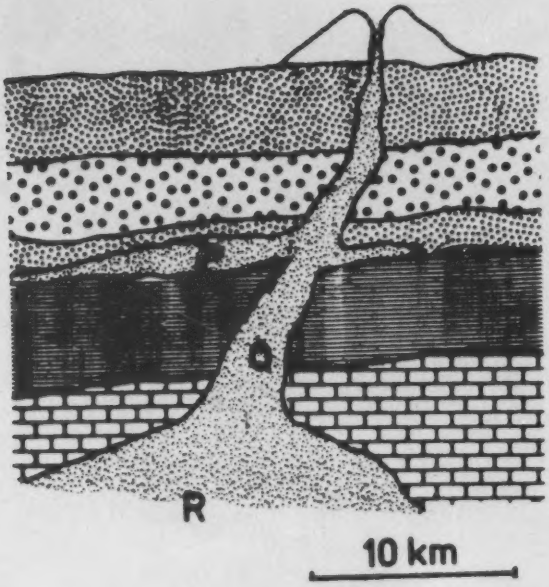


IGNEOUS ROCKS



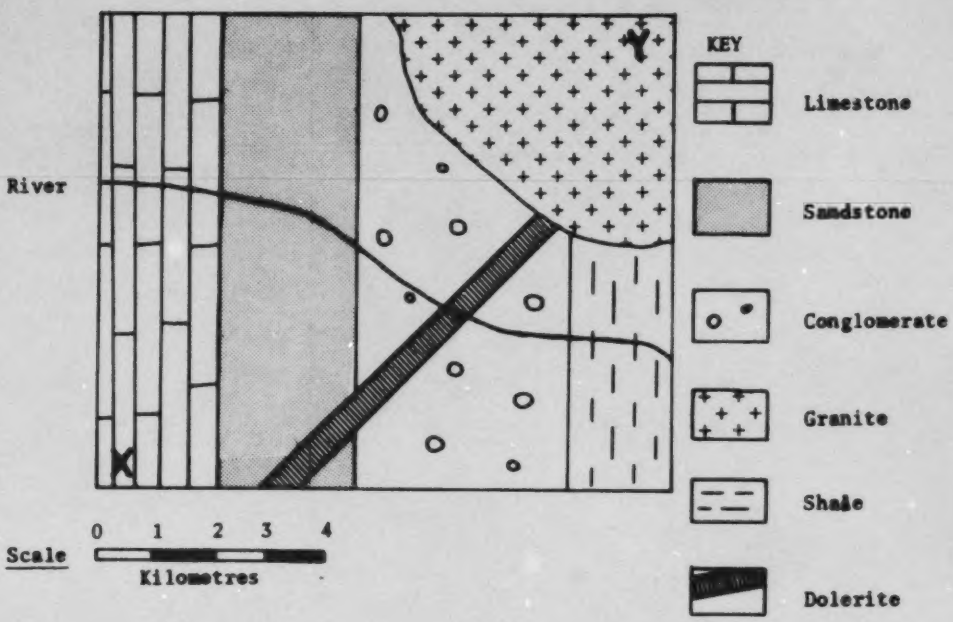
Which diagrams above contain one (or more) sills?

A. P and Q only.
B. Q and R only.
C. P, Q and R only.
D. P, Q and S only.



Which choice correctly labels the three structures indicated on the diagram above?

	Batholith	Sill	Dyke
A.	P	Q	R
B.	Q	R	P
C.	R	P	Q
D.	R	Q	P



A Geologist walking from point X to point Y made the following notes in his note book.
Which observation made by the Geologist is incorrect?

A. After crossing 2 kilometres of limestone I found sandstone.
B. 5.5 kilometres from point X I had to cross a small river.
C. About 3 kilometres of conglomerate were crossed between X and Y.
D. After crossing the river I saw a dolerite dyke about 100 metres off to the right.

D.2

166

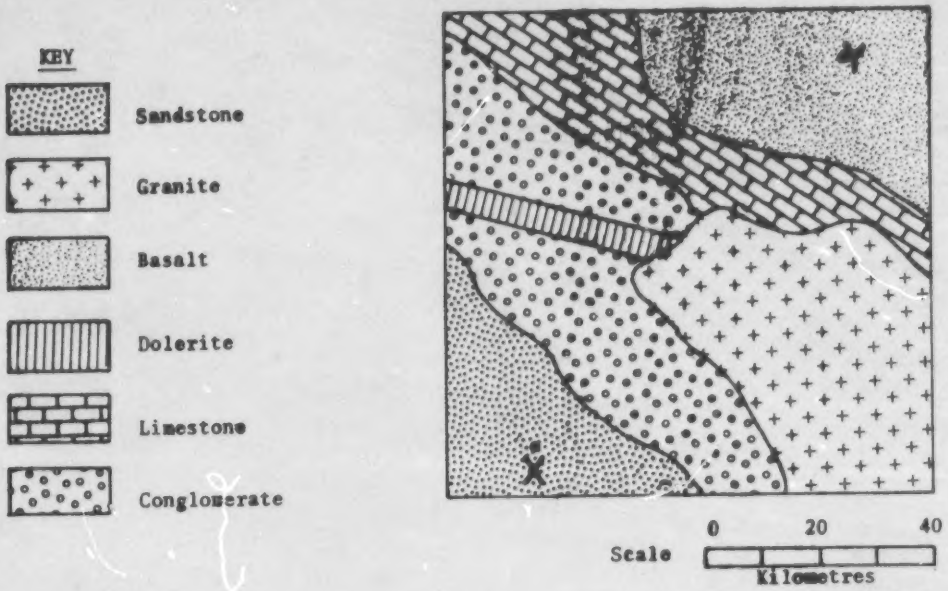
Which of the following provides the best reason why organisms which live in water tend to form fossils more easily than those which live on land?

A. They occur in greater numbers than land organisms.
B. It is easier for them to be embedded in rocks.
C. They are quickly buried by sediments when they die.
D. Sedimentary rocks are formed in watery environments.

C.3

167

The next two questions refer to this geological map.



A man walks from X(bottom left) to Y(top right) in a straight line. After leaving X he then crosses (in order) the rocks

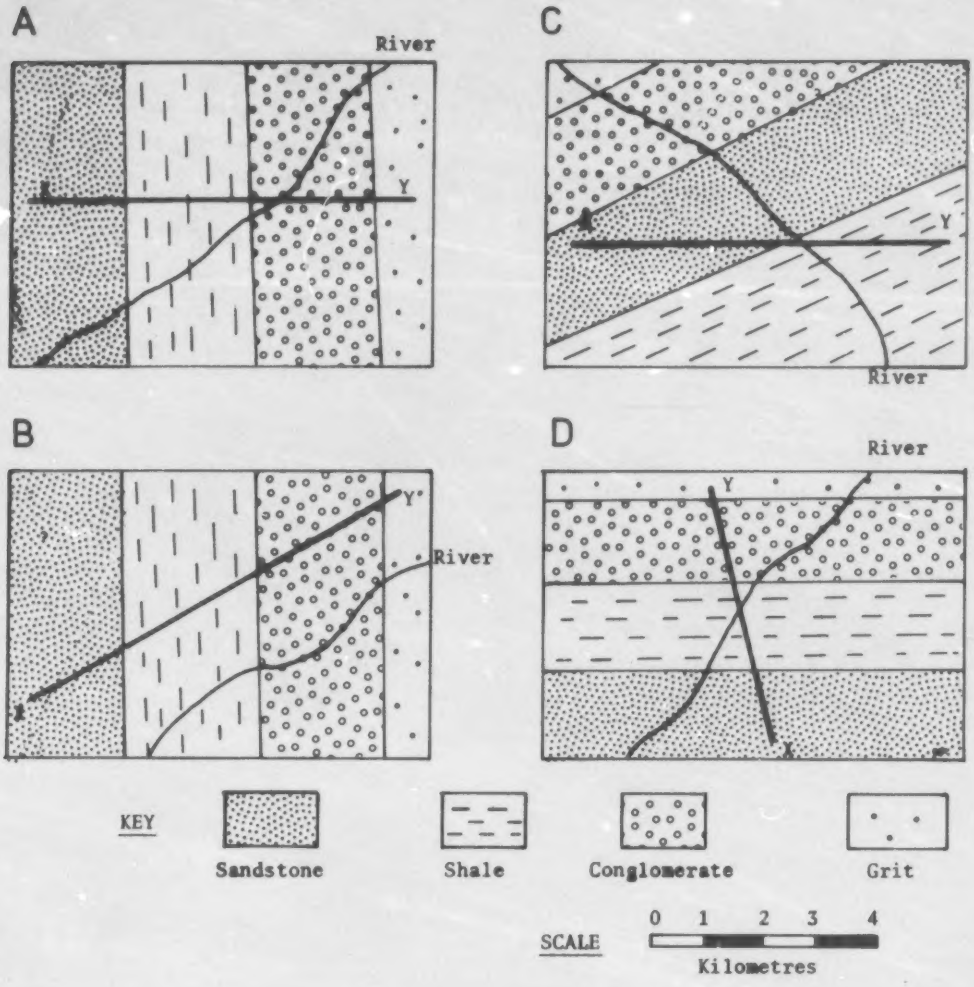
A. conglomerate, granite, limestone, basalt.
B. conglomerate, dolerite, limestone, basalt.
C. conglomerate, granite, dolerite, limestone, basalt.
D. conglomerate, dolerite, conglomerate, limestone, basalt.

A5. 168

How far does he walk before finding limestone? About

A. 15 km. B. 30 km. C. 55 km. D. 65 km.

C4 169



A geologist walking from X to Y wrote in his field notes,

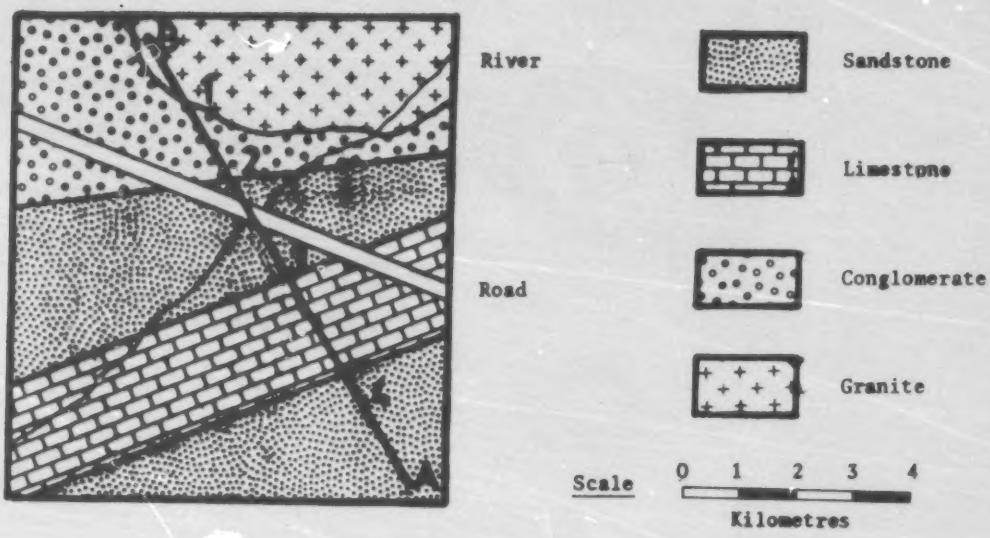
"after about 2 kilometres I found shale and could see trees marking the river about 1.5 kilometres off to my right."

Which map was he most probably following?

A. B. C. D.

B3 170

The next question refers to this geological map.



A geologist walking from A to B along the heavy line made the following observations while walking:

> "Directly ahead I could just see the bridge. While sitting on a large sandstone outcrop I could see trees marking the position of the river about 2.5 kilometres to my left."

Where was the man when he made these observations?
Closest to point

A. 1. B. 2. C. 3. D. 4.

C.3

171

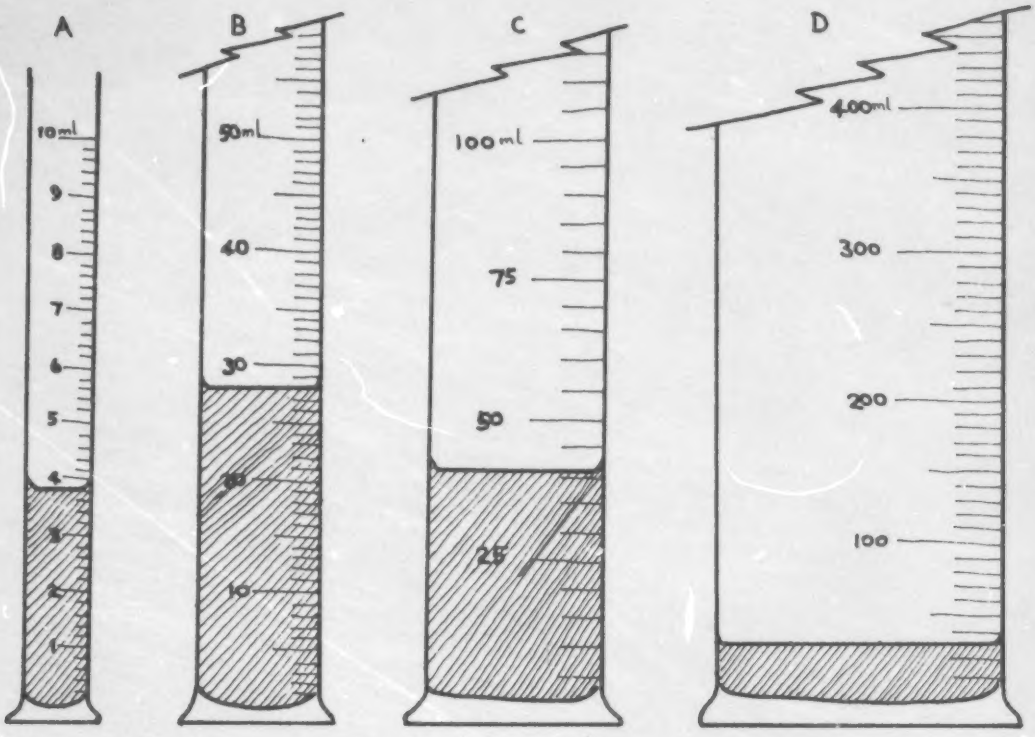
Stalactites and stalagmites are geological features found in

A. a glacial valley after the glacier melts.
B. lava flows.
C. limestone caves.
D. underground oil reservoirs.

C.4

172

The next six questions refer to the following diagram.



Which container contains 28 millilitres of water?

A. A. C. C.
B. B. D. D.

B.5

173

Which of the containers drawn above would you use to most accurately measure 35 millilitres of water?

A. A. C. C.
B. B. D. D.

B.3

174

On which cylinder does each scale mark represent 0.. millilitres

A. A. C. C.
B. B. D. D.

A.3

175

On which cylinder does each scale mark represent 1 ml ?

A. A B. B C. C D. D

B.3 176

On which cylinder does each scale mark represent 5 millilitres?

A. A B. B C. C D. D

C.3 177

On which cylinder does each scale mark represent 10 ml.?

A. A B. B C. C D. D

D.3 178

The number 18.76 expressed to the nearest order of magnitude is

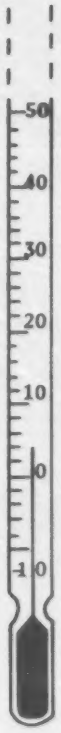
A. 10^1 B. 10^2 C. 10^3 D. 10^4

A.2 179

The diagram on the right shows a portion of a -10^0C to 110^0C thermometer.

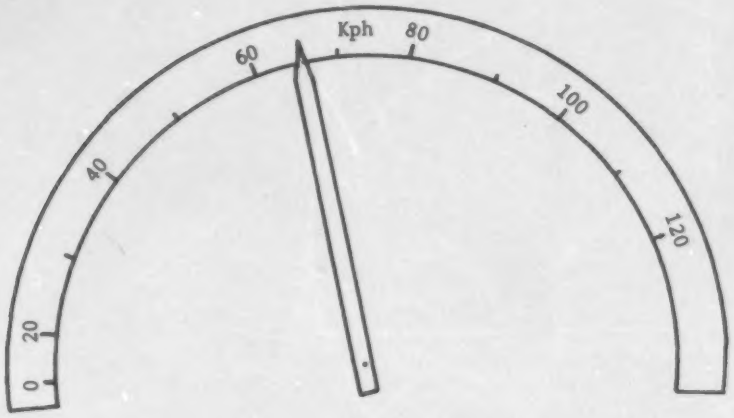
The reading on the thermometer is closest to

A. 0^0C.
B. 2^0C.
C. 4^0C.
D. 6^0C.



C.4 180

A car speedometer is pictured below.



The speed registered on the speedometer is closest to

A. 50 kph.
B. 60 kph.
C. 65 kph.
D. 70 kph.

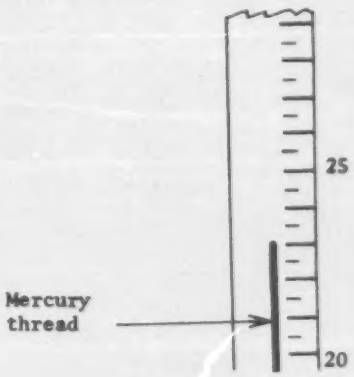
C.5

181

The next question refers to the diagram below, which is a portion of a 0° - 50° thermometer.

The temperature reading on the thermometer would be closest to

A. 26°C.
B. 23°C.
C. $22\frac{1}{8}$°C.
D. $20\frac{1}{2}$°C.



B.4

182

Following is a common form of kilometre chart showing the distances between major centres. This particular one is an extract from the back of a N.S.W. road map. Study the chart carefully and answer the question which follows it.

NOTE: NO instruction as to how to read this table was given with the road map.

BATEMANS BAY											
347	BATHURST										
158	505	BEGA									
893	598	978	BOURKE								
1158	953	1220	542	BROKEN HILL							
262	202	420	783	1157	CAMDEN						
152	297	238	726	1125	253	CANBERRA					
1082	753	1238	917	1460	912	1082	CASINO				
473	350	635	780	1305	223	462	613	NEWCASTLE			
125	340	283	922	1150	137	232	862	360	NOWRA		
353	57	505	557	895	258	312	812	408	398	ORANGE	
292	217	450	813	1155	65	318	795	185	167	273	SYDNEY
723	375	970	587	1067	462	718	458	598	598	433	453 TAMWORTH

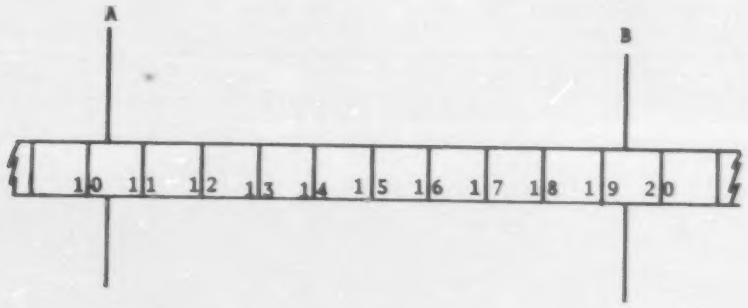
The distance from Bathurst to Casino is 753 km. Of the following, how much further is the distance from Bathurst to Broken Hill compared with the distance from Bathurst to Casino? Is it

A. 200 km.
B. 577 km.
C. 300 km.
D. 263 km.

A.4

183

This question refers to the picture below.



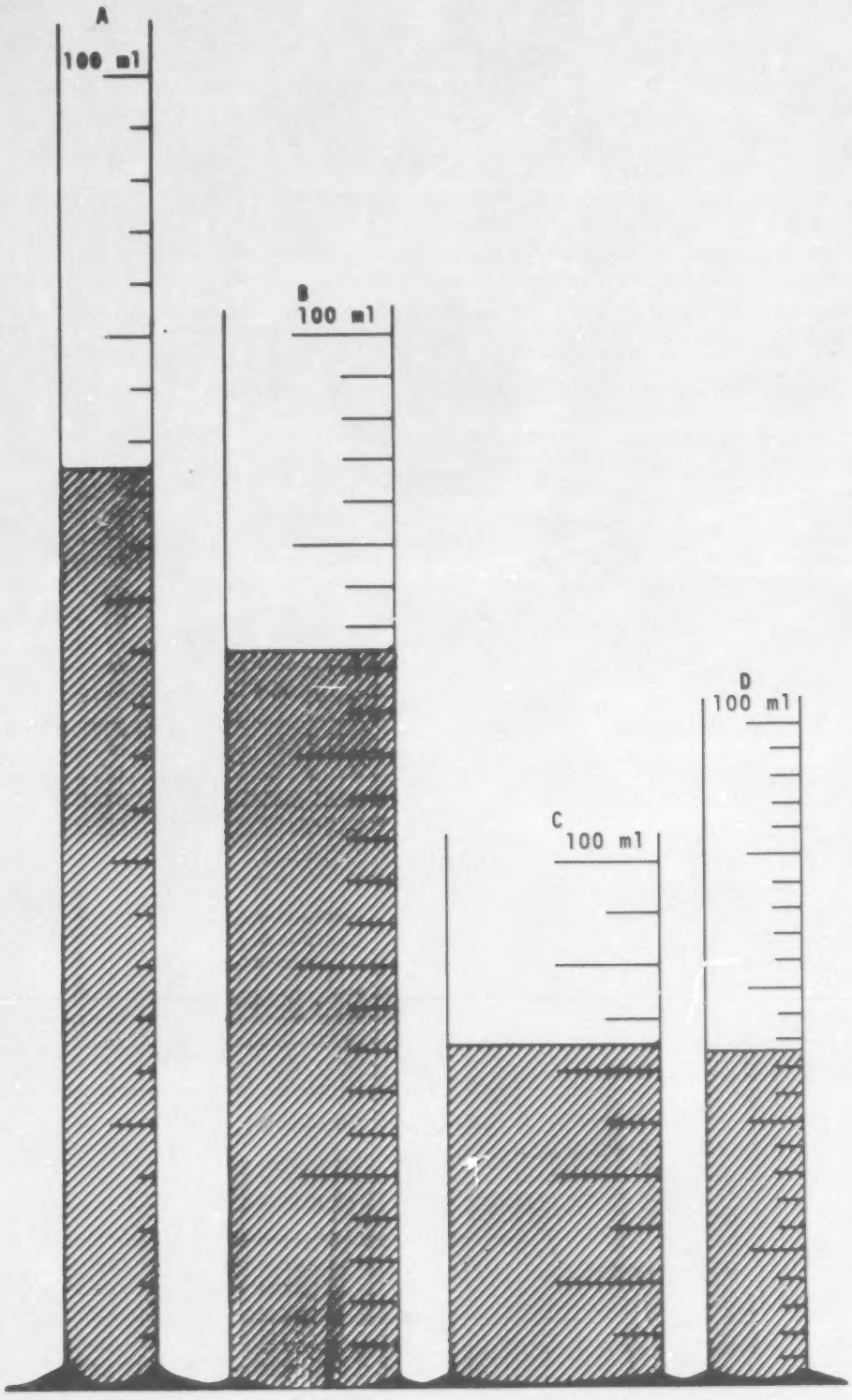
The distance between the two lines A and B is nearest to

A. 10 cm.
B. 9 cm.
C. 19 cm.
D. 20 cm.

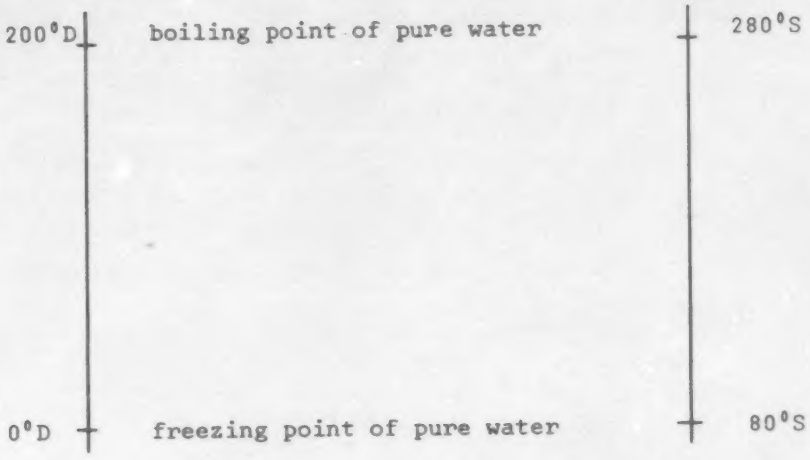
B.4

184

The four measuring cylinders shown below have *not* been drawn to scale.
Which cylinder contains 65 millilitres (ml) of liquid?



A scientist is thinking of using these two temperature scales:



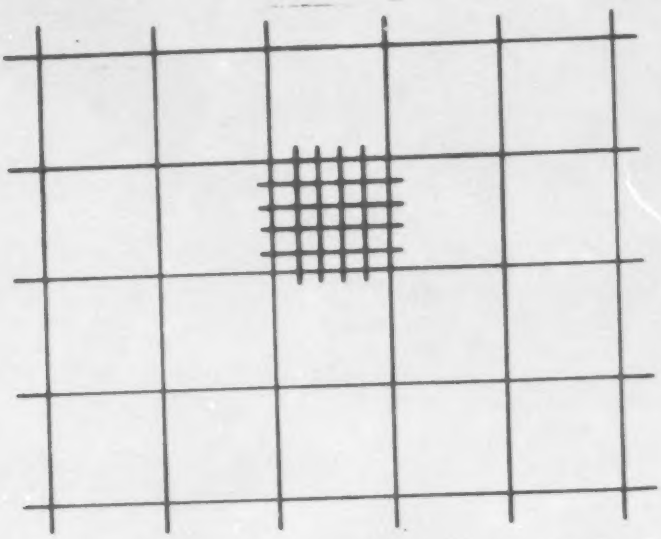
If room temperature is 10°D, what is the temperature on the other scale?

A. 10°S
B. 90°S
C. 100°S
D. 270°S

B.4

186

Look at the grid drawn below. If each of the large squares is 1 metre x 1 metre, what is the length of a side of a small square?

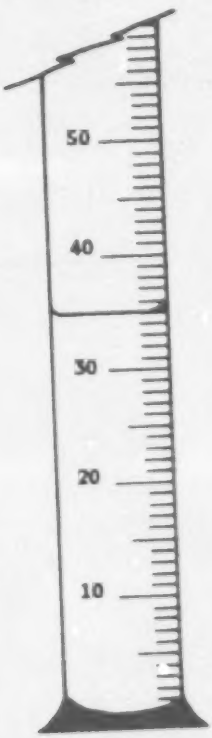


A. 5 millimetres.
B. 20 centimetres.
C. 40 centimetres.
D. 5 metres.

B.3

187

This question refers to the picture on the left.



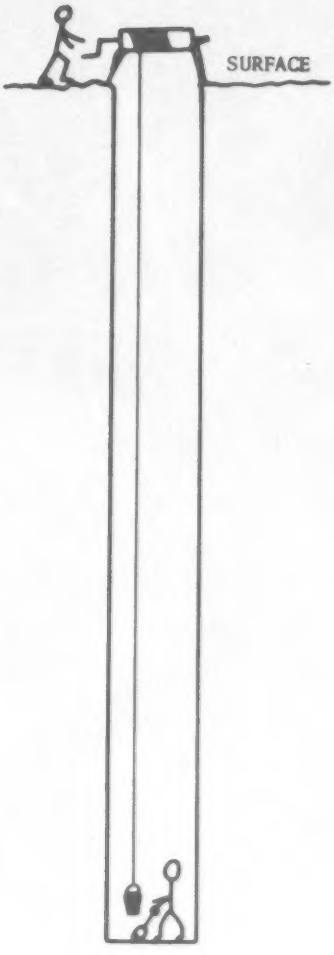
How much water is in the measuring cylinder?

A. 30.5 ml.
B. 35 ml.
C. 35.5 ml.
D. 36 ml.

B.3

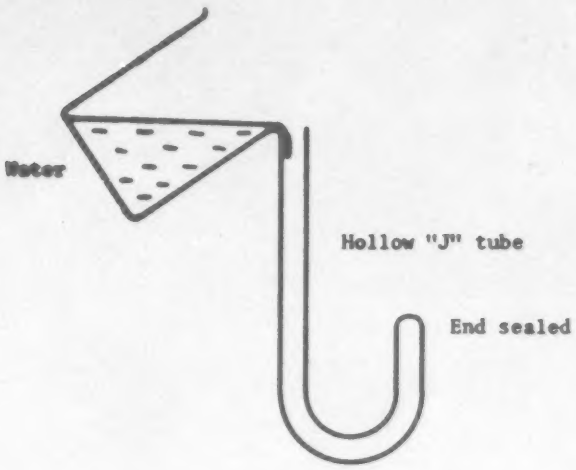
188

The man in this picture is digging a well. If the man is 2 metres tall approximately how deep is the well?

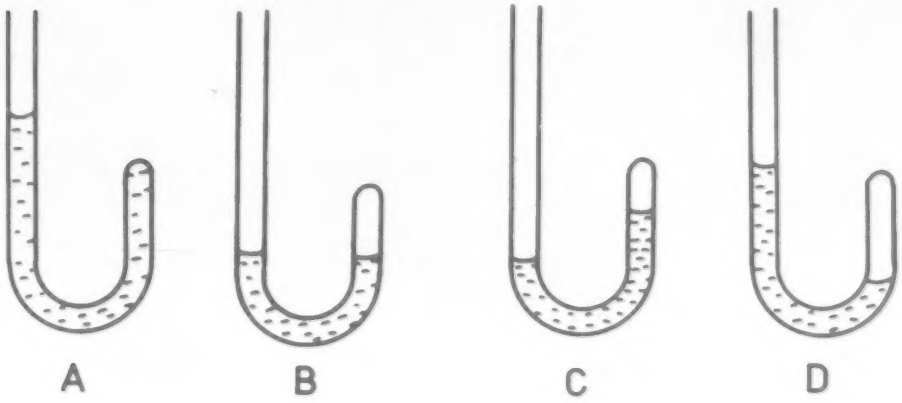


A. 15 metres.
B. 20 metres.
C. 25 metres.
D. 30 metres.

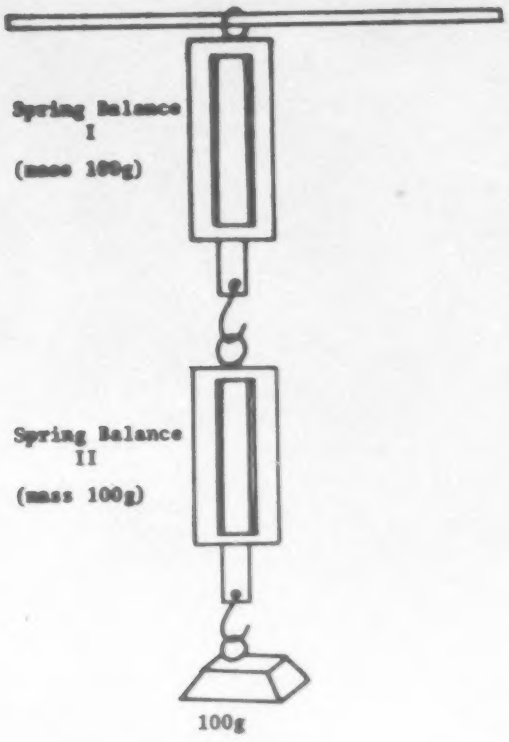
The next question refers to this diagram.



Water is poured into the J-tube pictured above.
Of the following diagrams, which best illustrates where the water levels will finish up.



This question refers to the diagram below which shows two spring balances each of 100 grams supporting a mass of 100 grams.



The correct indication of the two spring balances is

	Spring Balance I	Spring Balance II
A.	100 grams	100 grams
B.	100 grams	200 grams
C.	200 grams	100 grams
D.	200 grams	200 grams

The next three questions refer to the following information.

An inventor has developed an instrument to measure the 'heteroeasibility' of various substances placed in a funnel on top of the instrument. On the front of the instrument are the following:

(i) a meter which registers the 'heteroeasibility' (scale reading 0 to 20);

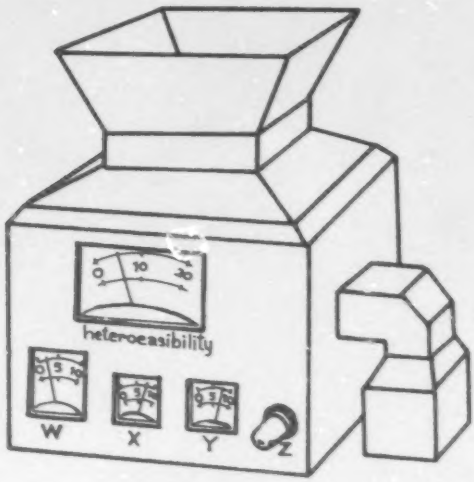
(ii) a meter which records the value of property *W* (scale reading 0 to 10);

(iii) a meter which records the value of property *X* (scale reading 0 to 10);

(iv) a meter which records the value of property *Y* (scale reading 0 to 10);

(v) a globe which lights up if property *Z* is present in the substance.

The instrument is pictured below.



Corresponding readings obtained for a number of substances are listed below:

Heteroeasibility *(H)*	*W*	*X*	*Y*	*Z*
20	10	10	0	present
15	10	10	5	present
0	10	10	0	absent
0	10	10	5	absent
5	5	10	10	present
0	5	10	10	absent
5	0	10	5	present
0	5	5	10	present
0	0	10	5	absent

The next three questions on this page refer to the information on the previous page.

If Z is absent, which of the following relationships is consistent with the information in the table?

A. $H = 0$
B. $H = W + X - Y$
C. $H = 2X - 2Y$
D. none of the above.

A.2 192

If Z is present, which of the following relationships is consistent with the information in the table?

A. $H = 2W - Y$
B. $H = W + X + Y$
C. $H = W + X - Y$
D. none of the above.

C.1 193

In answering this question, assume that the relationships established above apply for all readings of H, W, X, Y and Z.
When $W = 6$, $X = 4$, $Y = 3$, and Z is present, H is

A. 0 B. 7 C. 9 D. 13

B.2 194

Some students were asked to determine the volume of a cube of sugar. They suggested two ways of doing this as follows:

Method 1: Place the cube in a measuring cylinder of water to determine how much water is displaced (pushed up). The water displaced would be equal to the volume of the cube.

Method 2: Measure the sides of the cube and calculate the volume (i.e. volume = length x breadth x height).

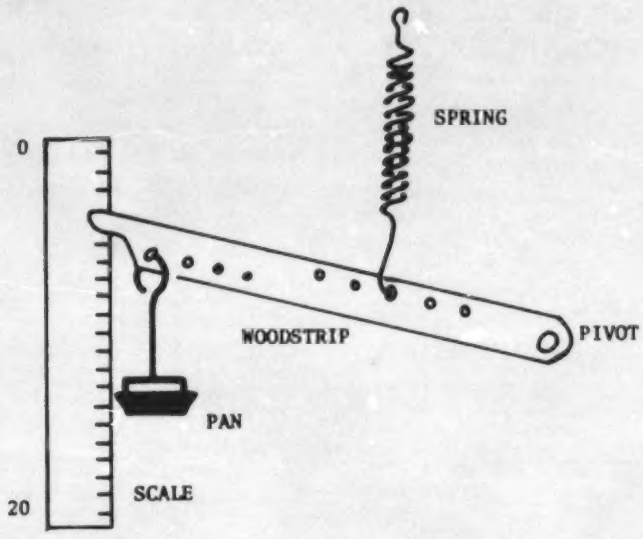
After further discussion they decided not to pursue Method 1 but decided to use Method 2. The most likely reason for their choice would be that:

A. Method 2 is not so messy and would be easier to do compared with Method 1.
B. one of sugar's properties makes Method 1 unlikely.
C. measuring cylinders are never very accurate.
D. air trapped in the sugar cube would give rise to an inaccurate measurement using Method 1.

B.2 195

The diagram shown below relates to t[illegible] question.

In the experiment shown, similar-sized masses are loaded one by one on to the pan and as the wooden strip moves down, the reading on the scale is noted.



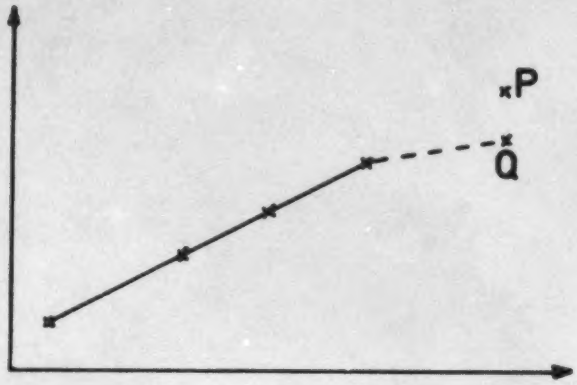
Here is one set of results:

No. of Masses on Pan	Reading on Scale
1	3
2	5
4	8
5	10
6	19

Since the last result appears wrong the student, in writing up his report, should

A. leave out the last result as it does not conform to the pattern of the others.
B. report all the results, noting that the last was unexpected.
C. alter the last result so that it conforms to the general pattern.
D. alter the last result only after checking with other group results.

A student obtained the following graphical results from an experiment (shown by the unbroken line).



On the basis of the results he expected his next reading to be in the region of point "P".
However, his experiment result, falling at point "Q", did not support his prediction.
What would you do if you obtained a similar result in an experiment you were doing?

A. Repeat the experimental run which gave point Q as a result.
B. Connect the graph points as shown by the dotted lines.
C. Disregard point Q, draw the graph so as to pass through P which is the more logical and correct result.
D. Check the previous readings to determine whether or not they are correct.

A.2 197

A solid cube, with a side of 10 cm has a mass of 11 500 grams.
A data book gives the following densities of some metals:

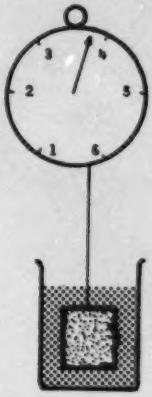
magnesium	1.74 g cm^{-3}
copper	8.96 g cm^{-3}
gold	19.3 g cm^{-3}
lead	11.4 g cm^{-3}

Of these substances, the cube is most likely to be made of

A. copper B. gold C. lead D. magnesium

C.3 198

A student weighed an object in air and in water by using a spring balance. The diagrams below show the readings.



The force exerted on the object by the water is nearest to

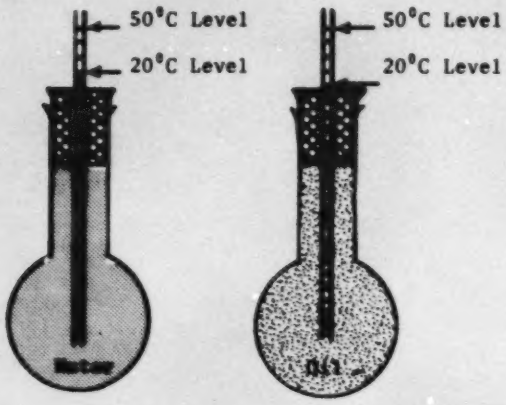
A. $3\frac{3}{4}$ units.

B. 4 units.

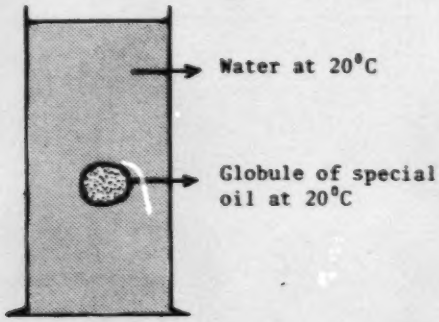
C. $\frac{1}{2}$ unit.

D. 3 units.

Pictured are two identical flasks, one filled with water, the other a special oil. At 50°C the levels in both flasks are the same. At 20°C the levels drop to those shown on the diagrams.



At 20°C, a globule of the special oil placed in the middle of a column of water neither rises nor sinks.



If the column of water were slowly warmed up to 50°C you would expect the suspended globule of oil to

A. sink to the bottom of the column.
B. rise to the top of the column.
C. remain where it is.
D. spread evenly through the entire column.

Humans working in the presence of the products of radioactive decay must be shielded since the products are dangerous to health. From which of the following radioactive decay products do humans require the most shielding?

A. α (alpha) particles.
B. $\beta-$ (beta minus) particles.
C. $\beta+$ (beta plus) particles.
D. γ (gamma) rays.

D.3. 201

Which of the following would NOT be a form of energy?

A. Sound. B. Lightning. C. Fog. D. Thunder.

C.5 202

Which of the following energy sources will be the most likely to outlast the other energy sources?

A. Solar heat.
B. Coal.
C. Petroleum.
D. Geothermal.

A.5 203

The table gives the amount of heat energy, in joules, required to change the temperature of a given mass of water by a given amount.

mass of water (g)	*temp. change (C^0)* 10	15
50	2100 J	3150 J
200	8400 J	x J

e.g. 50 g of water requires 2100 J of heat energy to be raised through 10^0C .

Which of the following values is equivalent to x?

A. 5 250 B. 10 500 C. 12 600 D. 16 800

C.3 204

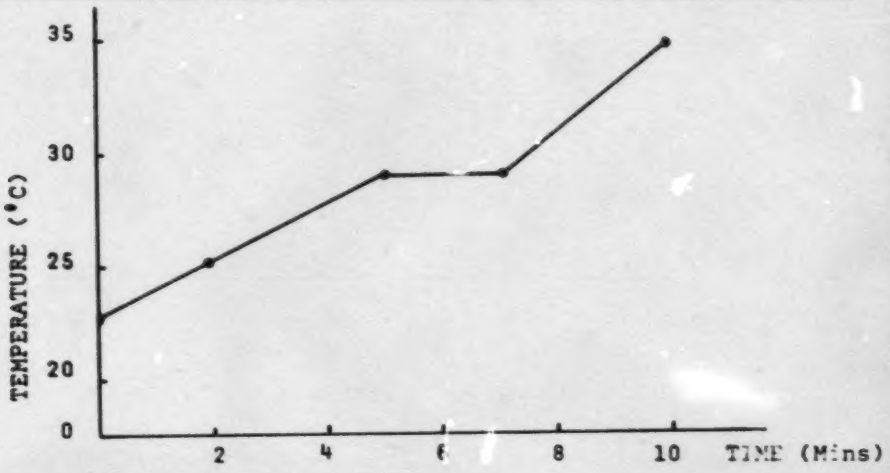
Four students worked together on an experiment in which they studied the heating of a solid. Temperature changes and time of heating were noted. They recorded their results in different ways as shown below.
The one which allows the reader to see *most quickly and clearly* how the temperature of the solid changes with time is:

A.

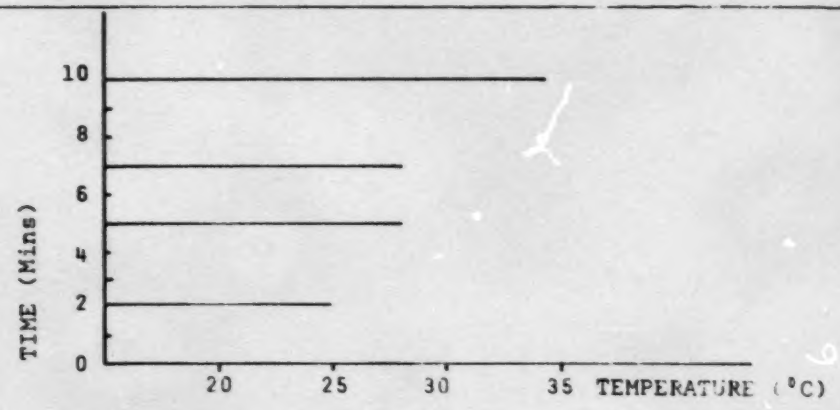
TIME (Minutes)	TEMPERATURE (°C)
0	23
2	25
5	28
7	28
10	34

B. It took two minutes for the temperature to rise from 23°C to 25°C, then 3 minutes for it to rise to 28°C. During the next two minutes the temperature remained constant, but in the next 3 minutes it rose to 34°C.

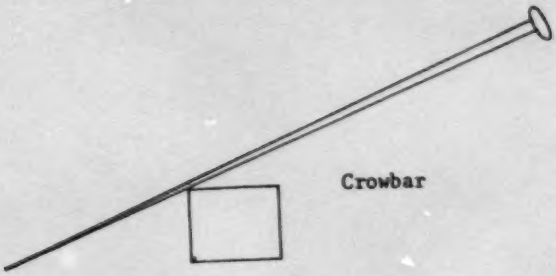
C.

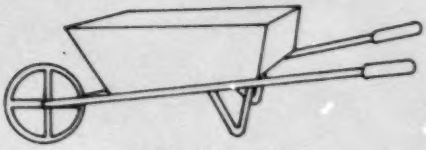


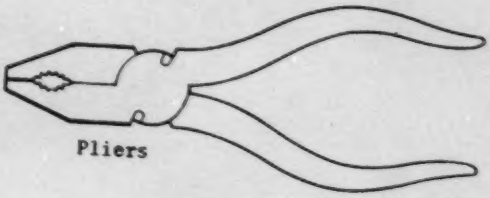
D.



Four simple types of machines are drawn below.







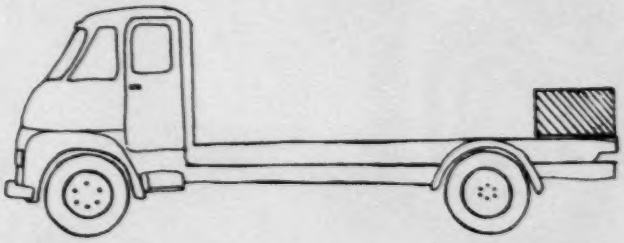
The two machines which are similar in relation to the load and effort positions are

A. pliers and crowbar.
B. forceps and wheelbarrow.
C. crowbar and forceps.
D. wheelbarrow and pliers.

A.3

206

The next question refers to the diagram below.



You have to unload the large, heavy crate from the back of the truck.

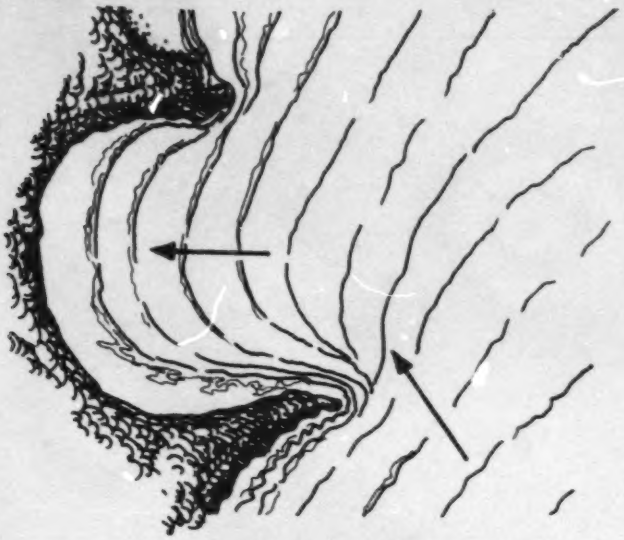
A machine you would use to do this with reasonable ease is

A. lever.
B. ramp.
C. pulley system.
D. crowbar.

B.3

207

The picture below shows a series of waves hitting a coastline.



The bending of the waves as they approach the coastline is due to

A. a change in the depth of the water.
B. a change in the direction of the wind.
C. the presence of a longshore current.
D. the presence of a sandbank in the middle of the inlet.

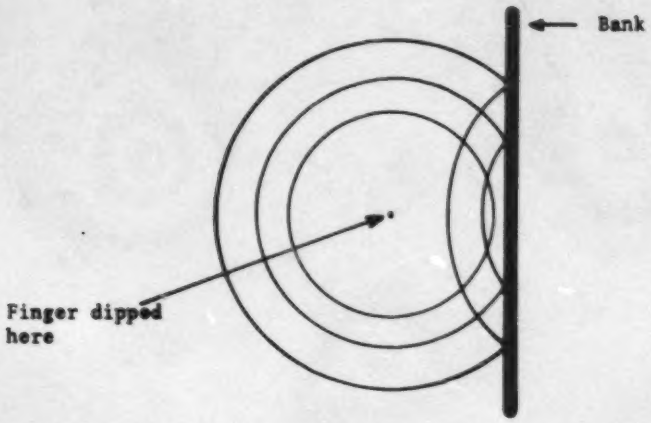
A.1 208

When a camera is used to take a picture, the lens at the front of the camera casts an image of the subject onto the film at the back of the camera. The best description of this image is

	Size Compared With Subject	Which Way Up	Colour or Black/White
A.	Larger	Right Way Up	Black/White
B.	Smaller	Upside Down	Full Colour
C.	Larger	Upside Down	Black/White
D.	Smaller	Right Way Up	Full Colour

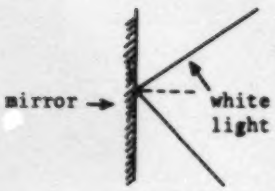
B.3 209

While bushwalking a boy comes across a small still pool. The boy dips his finger in and out of the pool. The pattern of waves produced is shown below.

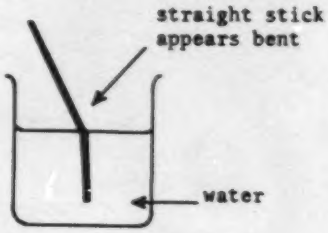


Of the diagrams below, the one which shows light behaving in a similar way to the water when it hits the bank is

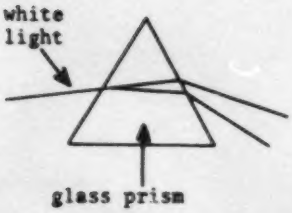
A



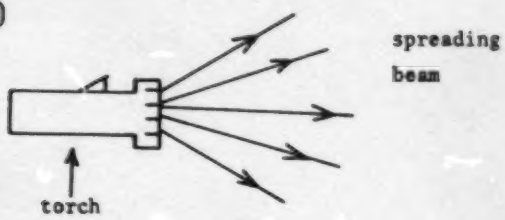
B

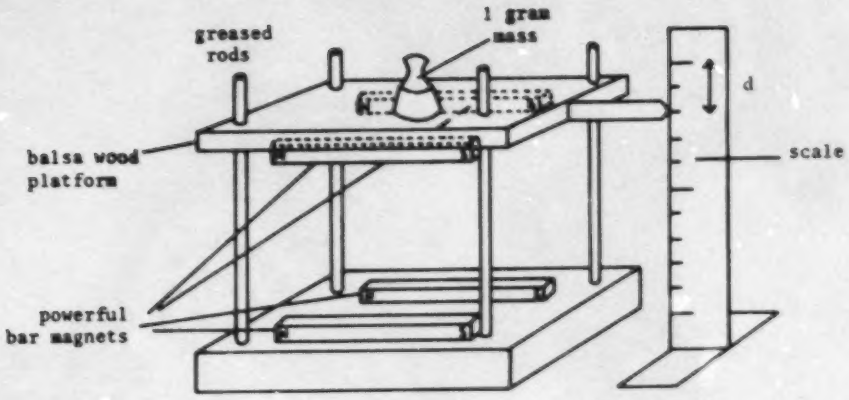


C



D





A student builds a "repulsive" balance shown above, using four bar magnets. Before he can use the balance he calibrates the scale by placing 1, 3, 5 and 7g masses on the platform and recording the measurement "d" on the scale. He repeats this several times and his results are shown below.

Mass	1st reading	2nd reading	3rd reading
1g	2.0	2.1	1.9
3g	4.2	4.2	4.1
5g	4.8	4.9	4.6
7g	5.2	5.3	5.2

These results show:

A. that more masses should be used for calibration to increase the accuracy of the balance.
B. that only masses less than 1g can be used on the balance.
C. that the mass of the platform must be known before the balance is used.
D. that the balance cannot be calibrated because "d" does not vary regularly with the mass on the platform.

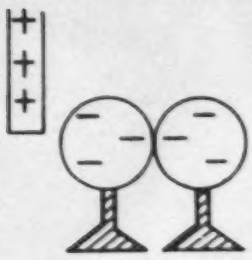
A.1 211

A needle was placed 20 cm from a plane mirror. The mirror was moved 5.0 cm towards the needle. What was the final distance between the neddle and its image?

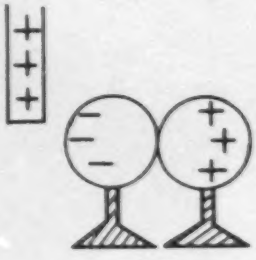
A. 25 cm. B. 30 cm. C. 35 cm. D. 40 cm.

B.1 212

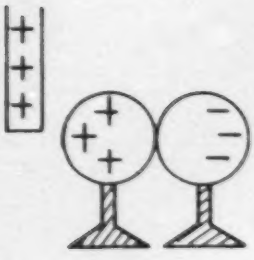
Two insulated conductors of the same size and shape initially with no net charge are brought in contact with each other. A positively charged rod is then brought near one of the conductors. Which one of the following diagrams best represents the charge distribution on the surfaces of the conductors?



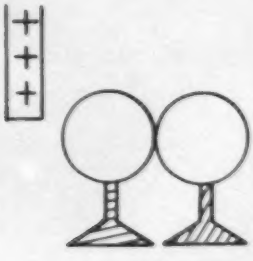
A



C



B



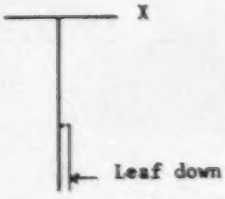
D

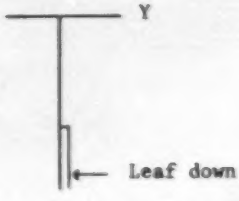
No overall charges or separation of charge

C.1

213

The diagrams represent 2 uncharged electroscopes.





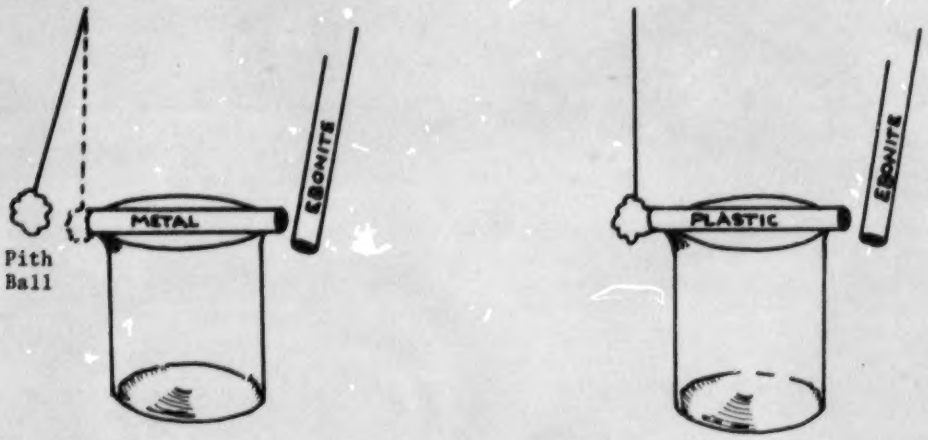
If a negatively charged rod is brought near X and a positively charged rod is brought near Y the effect on the leaves is

	Electroscope X	Electroscope Y
A.	up	down
B.	down	down
C.	down	up
D.	up	up

D.1

214

The picture below shows the behaviour of a pith ball touching a rod of metal or plastic when a charged ebonite rod is brought near the other end.



Which of the following best explains the behaviour of the pith ball?

A. There must be some electrons in metals which are free to move.
B. Pith adheres better to plastic materials than to metals.
C. It is impossible to put an electric charge onto plastic.
D. Pith is unreliable in its behaviour and the experiment should be repeated.

A2 215

The next question refers to this information.

A plastic rod which had been rubbed with silk was moved close to two test rods with these results:

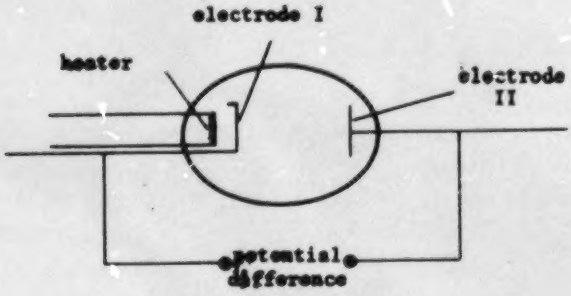
TEST ROD	TYPE	RESULT
1	perspex rod rubbed with silk	repelled
2	ebonite rod rubbed with silk	attracted

What is the best conclusion to be drawn from these results?

A. The test rods have the same electric charge.
B. The test rods have no electric charge.
C. The test rods have different electric charges.
D. The test rods were charged by the plastic rod.

C4 216

A thermionic diode is an electronic device consisting of two electrodes, one of which can be heated, housed in an evacuated glass tube, as represented in the diagram below. When operating in an electric circuit electrons can be made to travel from the heated electrode (I) to the other (II). For this electron flow to occur it is necessary to maintain a potential difference between the two electrodes.



A thermionic diode

If no current is observed to flow through the diode when it is connected to the potential difference, which one of the following procedures should be first carried out?

A. Cool electrode II so as to increase the difference in temperature between the two electrodes.
B. Check that the wires are connected to the appropriate terminals of the circuit element supplying the potential difference.
C. Move the electrodes closer together, but not touching.
D. Allow a small amount of air into the tube, but keep the internal pressure below atmospheric pressure.

B.2

217

Given a bar magnet and a solenoid, which one of the following methods would induce the greatest current in the solenoid?

A. Move the bar magnet quickly inside the solenoid.
B. Rest the bar magnet inside the solenoid.
C. Move the bar magnet quickly beside the solenoid.
D. Rest the bar magnet near the solenoid.

A.2

218

An electric current in a wire produces a magnetic field. In which of the following devices is this effect important to the operation of the device?

A. Incandescent light globe.
B. Fluorescent light tube.
C. Electric blanket.
D. Electric bell.

D.3

219

A man stands facing a mirror with a wall directly behind him. The wall is 6 m from the mirror, and the man is 2 m from the mirror. The image of the wall seen in the mirror by the man appears to be at a distance from him of

A. 4 m.
B. 6 m.
C. 8 m.
D. 12 m.

C.1

220

If a straight wire is suspended between the poles of a horseshoe magnet and an electric current passed through the wire, the wire moves.

This fact provides the basic information for the construction of

A. an electric motor.
B. a transformer.
C. an induction coil.
D. a generator.

A.1

221

Which one of the following particles would NOT be deflected when moving in a magnetic field?

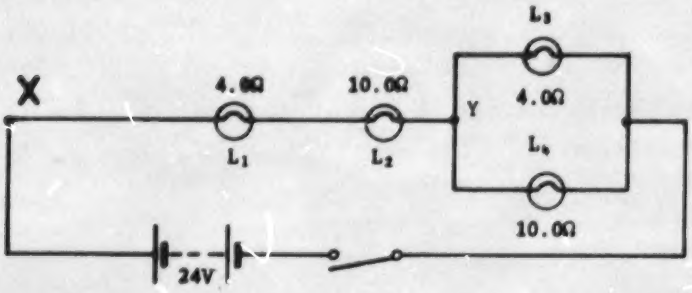
A. Electron.
B. Proton.
C. Neutron.
D. Metallic ion.

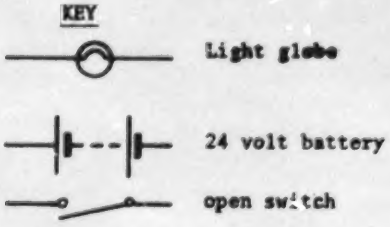
C.2

222

The next four questions refer to the following information.

An electrical circuit was set up which consisted of four light globes (L_1, L_2, L_3 and L_4) with the resistances shown, a switch and a 24 volt battery, as shown in the diagram below.





The potential difference across L_1 when the switch is closed will be

A. greater than 24 volts.
B. less than 24 volts.
C. equal to 24 volts.
D. varying continually.

B.1

223

The potential difference across L_3 is equal to

A. the potential difference across L_4.
B. the sum of the potential differences across L_1 and L_2.
C. the sum of the potential differences across L_1, L_2 and L_3.
D. 24 volts.

A.1

224

The next two questions refer to the information on the previous page.

Through which globe is the current least when the switch is closed?

A. L_1
B. L_2
C. L_3
D. L_4

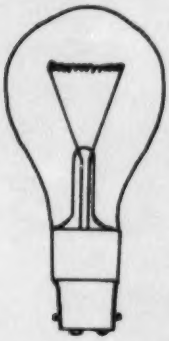
D.1 225

Of the following, the total resistance between X and Y is nearest to

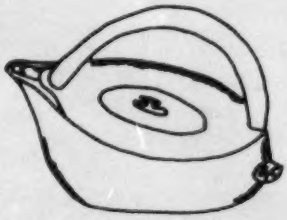
A. 2.5 ohms.
B. 6.0 ohms.
C. 14 ohms.
D. 40 ohms.

C.3 226

Pictured below are two common household appliances.



Light bulb
240 volts
120 watts



Electric kettle
240 volts
480 watts

Given that the following relationship is correct -

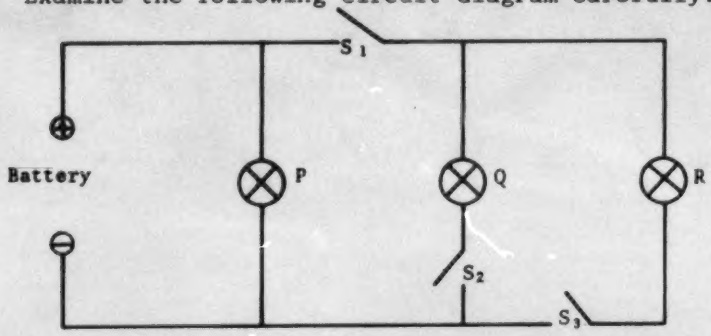
WATTS = AMPERES X VOLTS

the correct statement that can be deduced about the two appliances is that the light bulb

A. draws a higher current than the kettle.
B. has a higher resistance than the kettle.
C. has a higher power than the kettle.
D. uses more energy every second than the kettle does.

B.2 227

Examine the following circuit diagram carefully.



P, Q, R are electric lamps.
S_1, S_2, S_3, are switches.

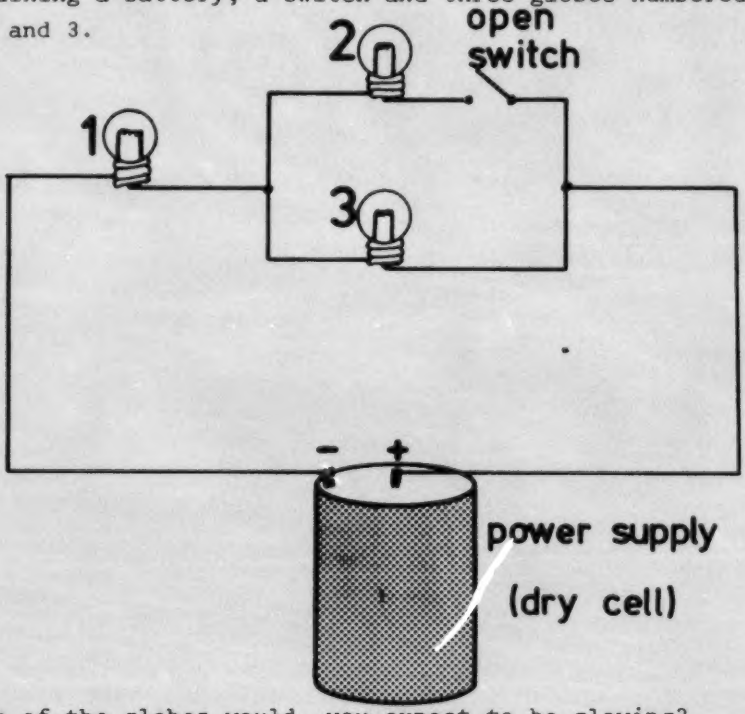
In order to have only lamps P and R alight, it would be necessary to have the switches as follows:

A. S_1 open, S_2 open, S_3 closed.
B. S_1 closed, S_2 closed, S_3 closed.
C. S_1 closed, S_2 open, S_3 closed.
D. S_1 closed, S_2 closed, S_3 open.

C.3

228

The diagram below represents a simple electrical circuit containing a battery, a switch and three globes numbered 1, 2 and 3.



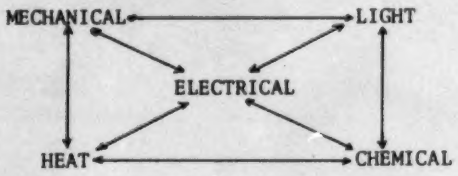
Which of the globes would you expect to be glowing?

A. Number 1 only.
B. Numbers 1 and 3.
C. Numbers 2 and 3.
D. None of them.

B.3

229

The next 4 questions refer to this diagram.



The above diagram was drawn to show that

A. chemical energy produces heat and light.
B. electrical energy produces heat and light.
C. mechanical energy produces heat and electricity.
D. one form of energy can produce another.

D.5 230

Passing an electrical current through water causes it to decompose into hydrogen and oxygen.

The energy change which occurs is shown on the above table as electrical energy to

A. mechanical.
B. heat.
C. light.
D. chemical.

D.3 231

The use of electric engines on trains shows one way man uses electrical energy to produce

A. light energy.
B. chemical energy.
C. mechanical energy.
D. heat energy.

C.5 232

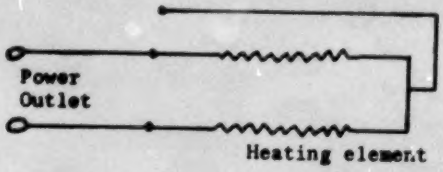
Which energy change occurs in the common torch battery (dry cell)?

A. Light to electrical.
B. Chemical to electrical.
C. Heat to electrical.
D. Mechanical to electrical.

B.3 233

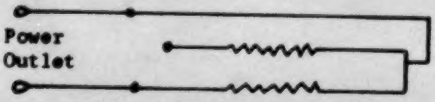
Many household heating appliances such as room heaters and electric blankets have three temperature settings - LOW, MEDIUM and HIGH. The three settings are obtained by using various combinations of two heating elements, as shown in the diagrams below.

LOW



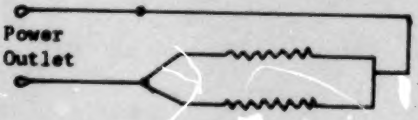
Two heating elements connected in SERIES - small current flows through each.

MEDIUM



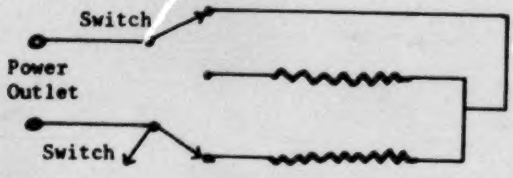
Only one heating element used in circuit - large current flows because of lower resistance.

HIGH



Two heating elements connected in PARALLEL - large current flows through each.

The diagram below shows the heating circuit of such an appliance, complete with switches, in a simplified form.



The temperature setting on the appliance shown in the diagram is

A. LOW.
B. MEDIUM.
C. HIGH.
D. OFF.

B.3

234

A man who brought a 110 v T.V. set back from America was told to use a transformer between the set and the wall power point. The reason for using the transformer would be to

A. transform the voltage entering the set to match that being transmitted by the T.V. station.
B. reduce interference from the mains.
C. convert direct current to alternating current.
D. reduce the mains voltage to that required by the set.

D.3

235

A stick is thrown into a running stream and the time measured for its travel of 10 metres on 5 separate occasions. The times obtained were:

1 minute 40 seconds, 2 minutes 10 seconds, 1 minute 10 seconds, 1 minute 20 seconds, exactly 2 minutes.

The average speed of the stick in the stream is nearest to

A. 100 metres per second.
B. 0.1 metres per second.
C. 1 metre per second.
D. 10 metres per 10 seconds.

B.2 236

Assume you are in a car travelling at 45 kilometres per hour (kph) and are passed on the same road by a car travelling at 60 kilometres per hour. At what speed would the other car be travelling, relative to your car, if it was passing your car in the opposite direction?

A. 15kph B. 45kph C. 50kph D. 105kph

D.2 237

Assume you are in a car travelling at 45 kilometres per hour (kph) and are passed on the same road by a car travelling at 60 kilometres per hour. At what speed would the other car be travelling, relative to your car, if it was passing your car in the same direction?

A. 15kph B. 45kph C. 60kph D. 105kph.

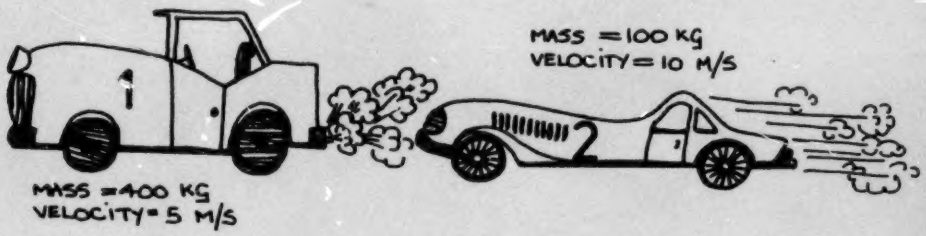
A.2 238

The equation in Physics which enables us to calculate the kinetic energy of an object is:

$$\text{Kinetic Energy} = \tfrac{1}{2} m v^2$$

where m = mass of object in kg.
v = velocity of object in m/s.

Consider the following cars moving along a road with masses and velocities as shown.



It is true to say that the kinetic energy of car 1 is

A. equal to that of car 2.
B. half that of car 2.
C. twice that of car 2.
D. four times that of car 2.

A.1

239

A student, who was fascinated by the way certain objects are attracted to magnets, gathered the following data:

OBJECT	ATTRACTION TO MAGNET	SILVER COLOUR
Gold ring	No	No
Brass tap	No	No
Iron nail	Yes	Yes
Copper kettle	No	No
Stainless steel knife	Yes	Yes

From this evidence, he concluded that all objects which are silver are attracted to magnets. Another conclusion he could have drawn is

A. coloured objects are never attracted to magnets.
B. iron and steel are attracted to magnets.
C. a magnet would not attract a gold plated knife.
D. there are more objects which are attracted to magnets than objects which are not attracted.

B.5

240

Galileo showed that if a large object and a small object are dropped together they both reach the ground at the same time. If we were to drop two different objects on the Moon where the gravitational pull is much less than that on Earth, then we would expect

A. the large object to fall faster than the small object but slower than it would fall on Earth.
B. the small object to fall faster than the large object but slower than it would fall on Earth.
C. both objects would reach the lunar surface together but would have fallen more slowly than on Earth.
D. both objects would reach the lunar surface together but would have fallen with the same speed as on Earth.

C.3

741

Three students each dropped different masses (50 g, 100 g and 150 g) in an experiment and calculated the acceleration due to gravity for each mass. They repeated the experiment another three times and tabulated their results as shown below:

Student	Mass	1st result	2nd result	3rd result	4th result	Average
1	50 g	10.2	10.1	10.0	10.1	10.1
2	100 g	10.0	9.6	10.2	10.1	10.0
3	150 g	10.1	9.8	10.0	10.1	10.0

The best conclusion that may be drawn from the above results is that the acceleration due to gravity

A. is 9.8 metres/sec/sec.
B. would be different on the Moon.
C. should not be averaged out.
D. does not depend upon mass.

D.3

242

Newton's 3rd law of motion explains that:
"For every force there is an equal and opposite force".

Which of the following situations illustrates this law?

A. A stone falling from a tall building.
B. An unsealed inflated balloon, when released, flies through the air.
C. The tendency of a moving object to keep moving.
D. A ball rolling down a slope.

B.2

243

The next three questions refer to the following information.

The table below gives the velocities in metres per second of bodies P, Q, R, S and T at times 0, 1, 2 and 3 seconds.

time \ body	P	Q	R	S	T
0 s	2	12	10	0	4
1 s	4	9	20	5	4
2 s	6	6	30	20	4
3 s	8	3	40	45	4

Which one of the following bodies has no net force acting?

A. P.
B. R.
C. S.
D. T.

D.2

244

On which one of the following bodies is the net force acting in a direction opposite to its motion?

A. P.
B. Q.
C. R.
D. S.

B.3

245

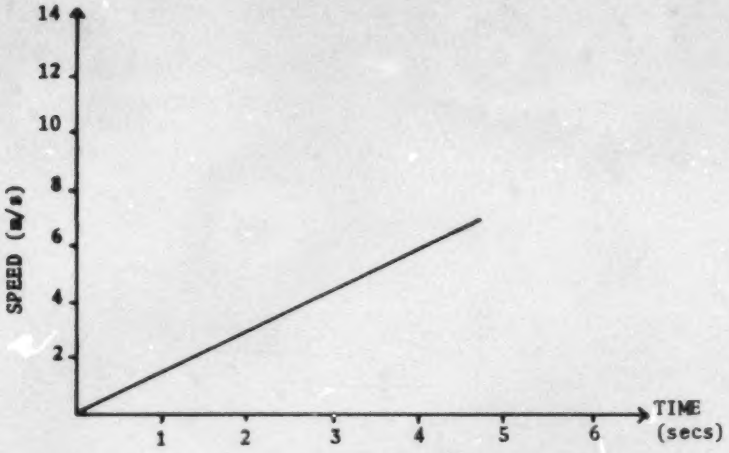
What is the magnitude of the average acceleration of body Q during the first three seconds that were recorded?

A. 1.5 m/s^{-2}
B. 3.0 m/s^{-2}
C. 4.5 m/s^{-2}
D. 6.0 m/s^{-2}

B.3

246

The graph drawn below shows the relationship between the speed of a ball rolling down a hill and the time the ball has been rolling. Assume that the hill has a constant slope.



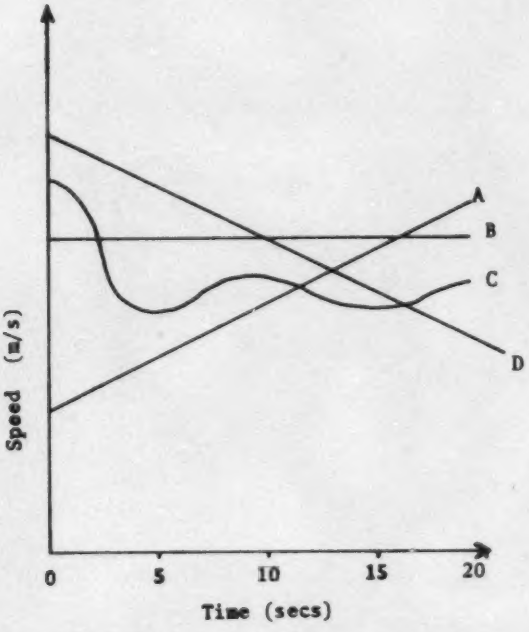
What is the most likely speed of the ball after 6 seconds if it continues to roll down the hill?

A. 7 m/s.
B. 8 m/s.
C. 9 m/s.
D. 10 m/s.

C.2

247

The next question refers to this graph.



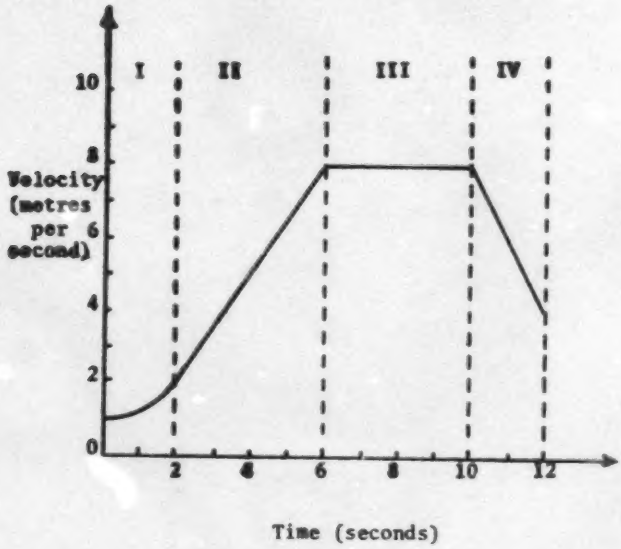
Which object was moving fastest at time 15 seconds?

B.2

248

The next two questions refer to the following information.

The velocity-time graph below illustrates the motion of a body moving in a straight line.



When was the object stationary?

A. At the start of period I.
B. During period II.
C. At the end of period IV.
D. At none of these times.

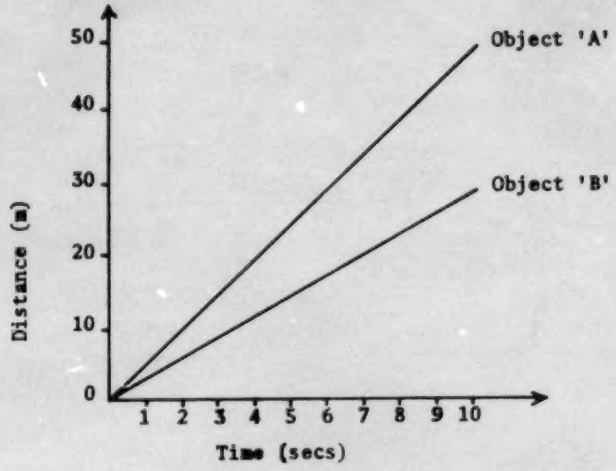
D1. 249

During which one of the periods I, II, III and IV, was the object travelling fastest?

A. I B. II C. III D. IV

C.1 250

Consider the following graph showing the distance travelled by two objects.



From this graph one could say that

A. after 10 seconds 'A' had travelled 20 metres further than 'B'.
B. both objects 'A' and 'B' had stopped moving after 10 seconds.
C. 'A' was climbing a steeper slope than 'B'.
D. both 'A' and 'B' started from the same point.

The next two questions refer to this article:

MARINER THROWS FIRST LIGHT ON MERCURY'S ORIGIN

Mariner 10 has just completed the most productive interplanetary exploration ever accomplished.

Last weekend the American space probe made an unprecedented third pass at Mercury, the scorched pockmarked planet nearest the sun.

Gliding through space at close to 25,000 miles an hour the 1,000-pound (454kg) craft went the closest any man-made space vehicle has come to another planet since the Soviet Union crash-landed a satellite on Venus in the late 1960's.

A year ago virtually nothing was known about the face of Mercury, but after these three photographic sessions there are now excellent pictures of the planet's surface available to earth scientists.

Details of the planet's surface as small as 150 yards was clearly visible because, according to scientists, Mercury's surface is five times brighter than the surface of the earth on the brightest day at high noon.

A laboratory spokesman said after the first batch of pictures arrived back on earth:

"Mercury looks like the moon, although it's somewhat different. The pictures show cratering, wells, rocks and ridges on the surface. They are very sharp."

Space scientists were also very excited by the analysis of information relayed back about Mercury's magnetic field.

The findings indicate that Mercury's magnetism is caused by a mechanism similar to that of earth. Dr. Ness, however, said the surface strength of the Mercurian field might be only 800 or 900 gammas, compared with the reading of 30,000 gammas at earth's equator.

"Sun-Herald" Sunday 23rd March, 1975

The most likely reason that Mercury's surface is "five times brighter than the surface of the Earth on the brightest day at high noon" is :

A. dust and pollution in the earth's atmosphere reduces the sunlight's strength.
B. Mercury is much closer to the Sun than Earth is.
C. Mercury's rocks and soil are a much paler colour than the Earth's.
D. Mercury gives off some light of its own because it is very hot.

This question refers to the article on the previous page.

The information about Mercury's magnetic field suggests that the planet Mercury may have a

A. stronger gravitational field than the Earth.
B. weaker gravitational field than the Moon.
C. similar surface to the Moon.
D. similar interior to the Earth.

D.2 253

This question refers to this table:

Planet	Approximate distance from Sun in millions of kilometres	Approximate diameter in kilometres
Mercury	58	4960
Venus	108	12320
Earth	150	12683
Mars	227	6720
Jupiter	775	125920
Saturn	1430	120160
Uranus	2860	46880
Neptune	4500	44320
Pluto	5900	estimated 6400

If the diameter of a planet was the only factor influencing the gravity of that planet, which planet(s), listed above would have a gravity closest to that of Earth?

A. Mercury. B. Venus. C. Mars and Pluto. D. Neptune.

B.4 254

If we observe the night sky, it will be noticed that stars that rise in the east set in the west.

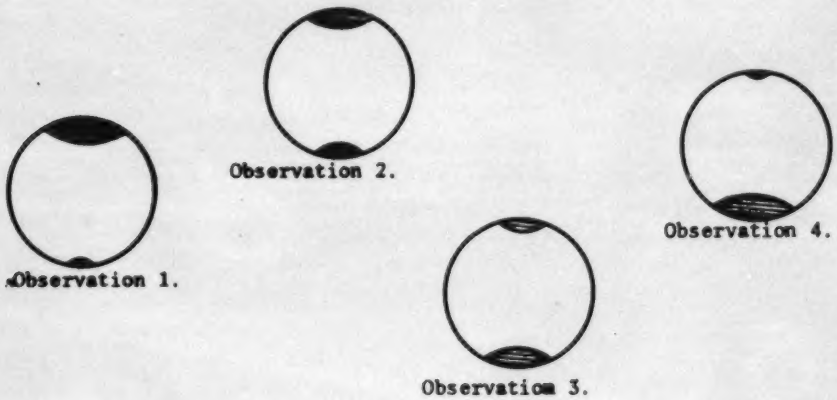
This occurs because of

A. Earth's revolution around the sun.
B. the stars' constant drift from east to west.
C. movement of our solar system drifting to the east.
D. Earth's rotation around its axis.

D.3

255

The following telescopic observations of the polar ice caps of Mars were made on successive occasions.



From the information obtained from the observations and knowing that the tilt of axis of Mars is similar to that of Earth, an Earth scientist could possibly conclude that the increase and reduction of the ice caps are a result of

A. heating of the planet.
B. cooling of the planet.
C. increase in the size of the oceans.
D. seasonal changes.

D.4

256

The next four questions refer to this newspaper report. Read the article carefully and then answer the questions below.

RUSSIAN CRAFT ON VENUS

MOSCOW, Wednesday - An unmanned Soviet spacecraft landed today on Venus after a five-month journey.

The Soviet news agency Tass said the descent vehicle of the Venus 9 craft made a soft landing on Earth's nearest planetary neighbour obtaining "a unique image of the surface".

The mother spaceship remained in orbit around the planet.

The landing vehicle took the first pictures from the surface of the planet. They were relayed back to Earth by the mother craft.

Moscow Radio said that transmissions lasted for 53 minutes, which could mean that the equipment may then have failed.

The descent craft did, however, analyse the soil, which may give valuable clues on the evolution of Venus.

(AAP-Reuter).

Sydney Morning Herald 23/10/75

The reason why the mother ship stayed in orbit around Venus was to

A. track the progress of the descent vehicle.
B. power the cameras of the descent vehicle.
C. transmit information back to Earth.
D. control the movement of the descent vehicle.

C.3

257

The fact that the transmission lasted only 53 minutes suggests that the

A. craft was damaged on landing.
B. equipment collecting information failed.
C. batteries powering cameras were flat.
D. vehicle ran out of fuel.

B.3

258

Some reasons for sending a space craft to Venus may be

X - it is our closest planet.
Y - scientists want close up pictures of its surface.
Z - scientists are interested in how Venus formed.

Of these reasons the article mentions -

A. X and Y.
B. Y and Z.
C. X and Z.
D. Z, X and Y.

D.2

259

Even though Venus is our closest neighbouring planet the spaceship still took 5 months to get there. One reason to explain the long time for the journey would be

A. close objects in space are many millions of miles apart.
B. Venus was on the opposite side of the Sun to the Earth.
C. scientists have not yet found the shortest route to Venus.
D. the spaceship had to travel slowly to conserve fuel.

A.4

260

In recent years astronomers have used rockets to send telescopes into orbit around the Earth to obtain better pictures of the stars. Out in space these telescopes produce better pictures because they

A. are operated by computer.
B. are much nearer the stars.
C. can work during day as well as night.
D. avoid the effects of the atmosphere.

D.3

261

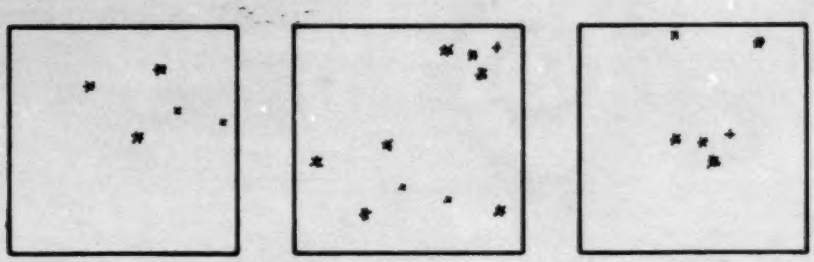
The Coal Sack Nebula in the Milky Way near the Southern Cross is most probably

A. a cloud of interstellar matter blotting out the light of more distant stars.
B. an area of sky where no stars exist because matter is not spread evenly through the Universe.
C. made up of particles of carbon.
D. a gap in the celestial sphere.

A.2

262

A camera is mounted on a tripod and pointed to one spot in the sky. Without moving the camera three photographs of the stars are taken an hour apart.



9.00 p.m. 10.00 p.m. 11.00 p.m.

The best explanation for these different photographs is that the

A. stars rotate about the universe.
B. pattern of stars is constantly changing.
C. Earth is rotating about the Sun.
D. Earth is rotating about its own axis.

D.3

263

Consider a situation in which scientists wish to place a satellite in orbit around Earth.
In which direction would they launch the rocket carrying the satellite in order to gain maximum benefit from Earth's rotational velocity?

A. North.
B. South.
C. East.
D. West.

C.2

264

The group of stars forming the Southern Cross is an example of a

A. galaxy.
B. constellation.
C. solar system.
D. nebula.

B.3

265

Astronomers use the light year as a unit of distance.
The light year is the distance travelled by light in one year (taken as 365 days).
The speed of light is 300 000 000 metres per second.

It has been suggested that distances on earth could be measured with this unit.

Approximately how many metres are there in a light second?

A. 300 000 000 x 365 x 24 x 60
B. 300 000 000 x 365 x 24
C. 300 000 000 x 365
D. 300 000 000

D1. 266

Space scientists expect that man will travel to other planets in the solar system during the next 100 years.
However, they do not think we will travel to planets of other suns in the universe in the next 100 years.
The main reason that trips to planets of other suns are unlikely, is that we

A. don't know in what direction to go to find other planets.
B. fear that the planets will have strange life forms which would kill the spacemen.
C. doubt that there are any other stars which have planets.
D. realize that such trips would take too long because the distances are so great.

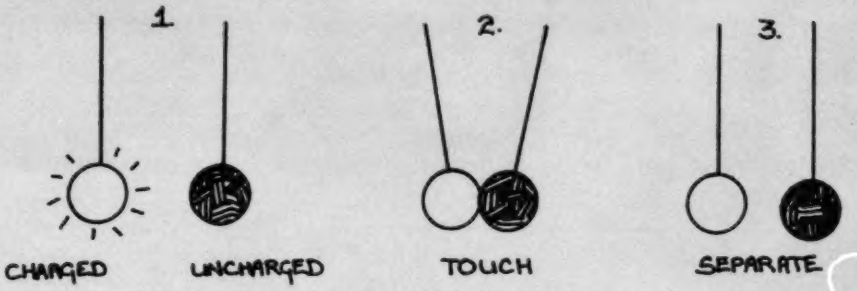
D5. 267

When astronauts visited the moon any dust they kicked up settled much faster than dust kicked up on earth. The *best* reason for this is that the

A. dust grains on the moon are much larger than the dust grains on earth.
B. moon has no atmosphere to slow the settling of the dust.
C. gravitational pull of the moon is much weaker than the gravitational pull of the earth.
D. astronauts can kick harder on the moon because of the weaker gravitational pull.

B3. 268

A charged, isolated pith ball was allowed to touch an isolated uncharged pith ball. The balls were then separated, as shown.

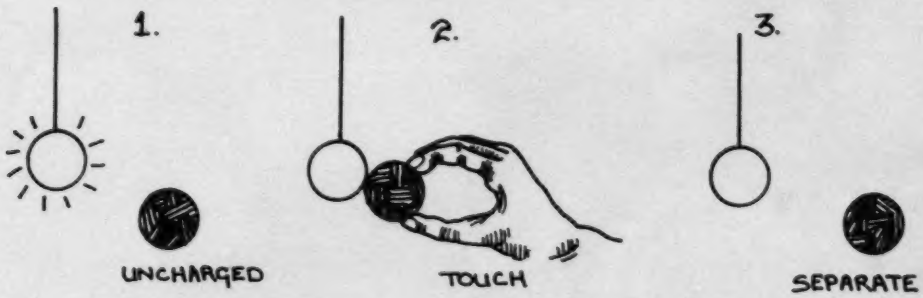


Which statement below is correct?
After separation

A. the black ball now carries all the charge.
B. both balls are uncharged.
C. each ball carries half the original charge.
D. the black ball will have slightly more charge than the white ball.

C3. 269

A charged pith ball was touched with an uncharged pith ball, and the two balls were separated again, as shown below.



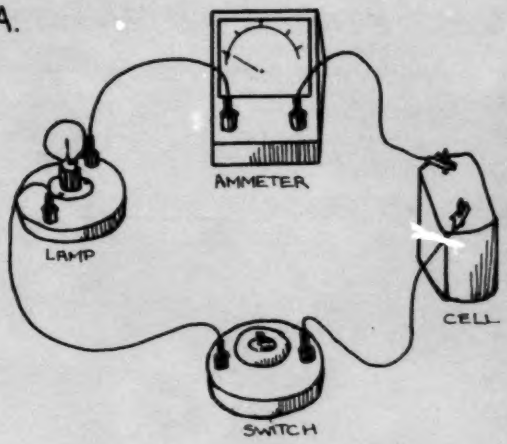
Which statement below is correct?
After separation

A. each ball carries half the original charge.
B. both balls are uncharged.
C. the black ball will carry all the original charge.
D. the white ball still carries all its original charge.

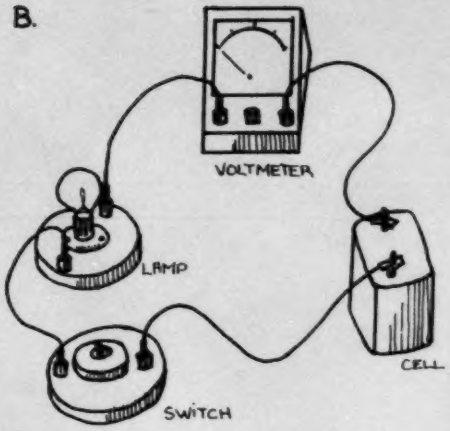
B2. 270

The next question refers to these electrical circuits.

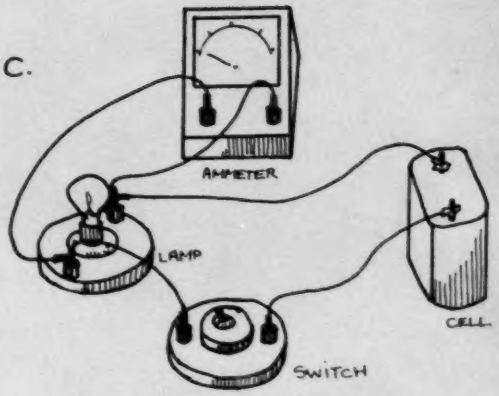
A.



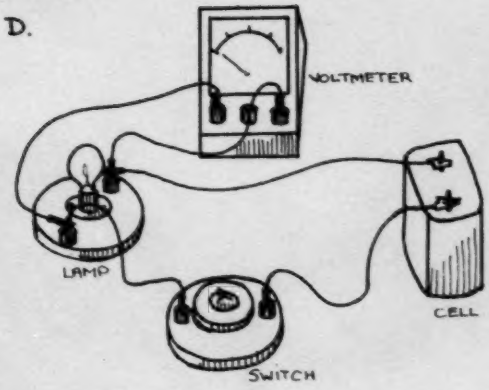
B.



C.



D.



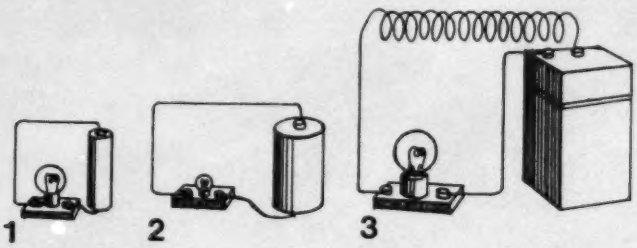
Which of the above electrical circuits, A, B, C or D, is wired to correctly measure the current flowing through the lamp?

A student measured the electric current flowing in a coil of wire and also its voltage. He noticed that when the voltage was 3 volts the current was 2 amps and for 9 volts the current was 6 amps.
Realizing the current was affected by voltage he decided to make a prediction of the current size when the voltage was 12 volts and test his prediction by measuring the current with a meter.
His prediction of current size for a voltage of 12 volts would be

A. 3 amps. B. 5 amps. C. 8 amps. D. 15 amps.

C4. 272

The diagrams below show three steps that were taken to find out how the voltage of a battery affects the brightness of a globe.



Is this a good way of finding out?

A. Yes, because the lengths of wire were kept the same in each step.
B. Yes, because the electric current was kept the same in each step.
C. No, because several things were different in each step.
D. No, because coiled wire should have been used in each step.

C4. 273

If a magnet is moved inside a coil of wire an electric current is produced in the coil.

This fact provides the basic information for the construction of a

A. transformer. C. induction coil.
B. generator. D. electric motor.

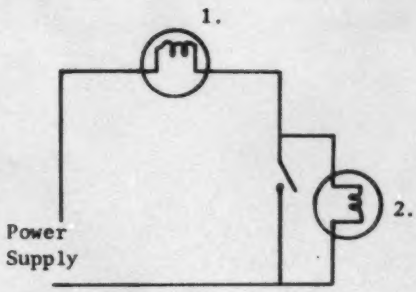
B2.

274

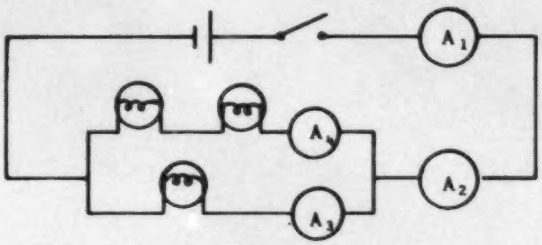
The next question refers to this electrical circuit.

If the switch in the circuit is closed, then

A. lamp 2 will become dimmer.
B. lamps 1 and 2 will both become dimmer.
C. lamp 2 will become brighter.
D. lamps 1 and 2 will both become brighter.



A2. 275



The three lamps in the above circuit are all exactly the same. When the switch is closed, the ammeter with the lowest reading will be

A. A_1 B. A_2 C. A_3 D. A_4

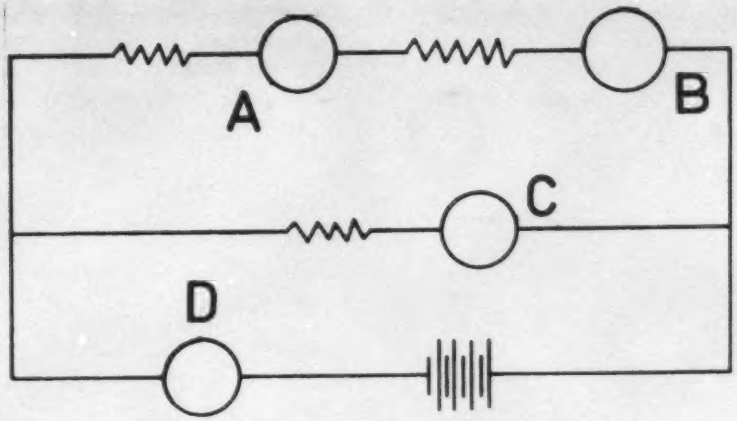
D1. 276

When heating a test-tube over a bunsen burner you should carry out all these procedures EXCEPT

A. moving the test tube gently in the flame.
B. sloping the test tube.
C. pointing the test tube towards you.
D. keeping the contents down to about 3cm from the bottom.

C5. 277

The next question refers to the diagram shown below.

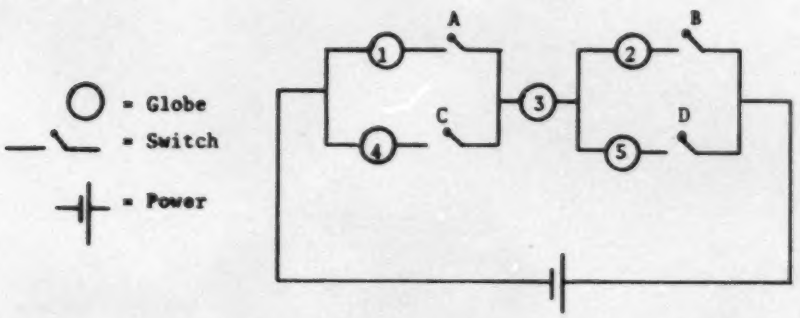


If the meters A,B,C and D above are all ammeters to measure electrical current, which meter would register the greatest current?

D3.

278

This question refers to this circuit diagram.



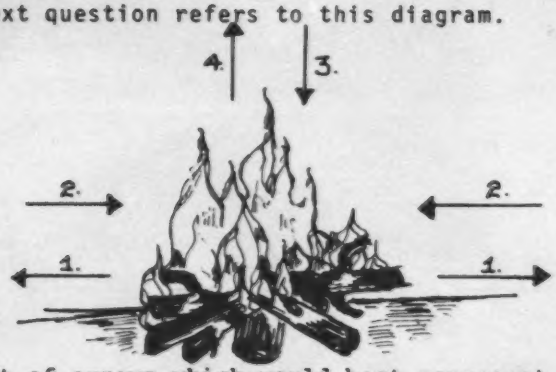
If switches A and D were closed in the above circuit, which globes would light up?

A. 1 and 5.
B. 1, 3 and 5.
C. 1, 2, 4 and 5.
D. 1, 2, 3, 4 and 5.

B3.

279

The next question refers to this diagram.



The set of arrows which would best represent the movement of air about the fire would be

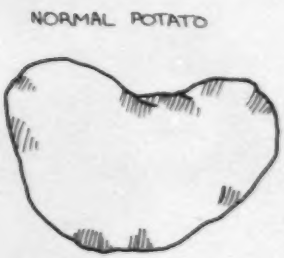
A. 1 and 3.
B. 2 and 4.
C. 1 and 4.
D. 2 and 3.

B3.

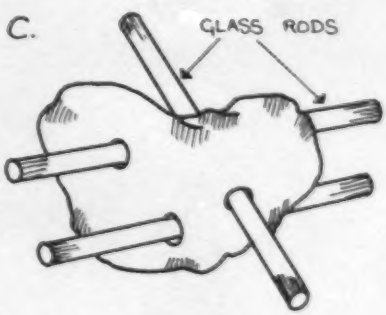
280

If the potatoes drawn below were each placed in the same oven, which would cook first - assume all potatoes are identical in shape, size and mass.

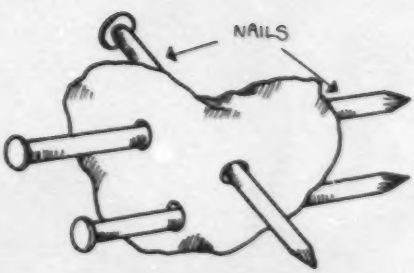
A.



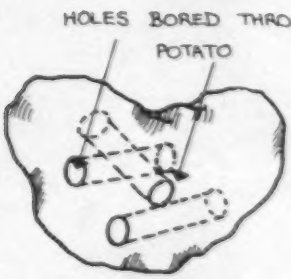
C.



B.



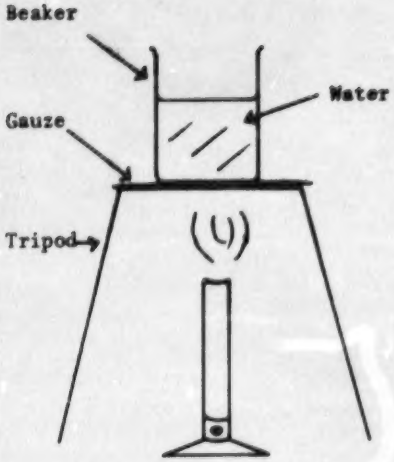
D.



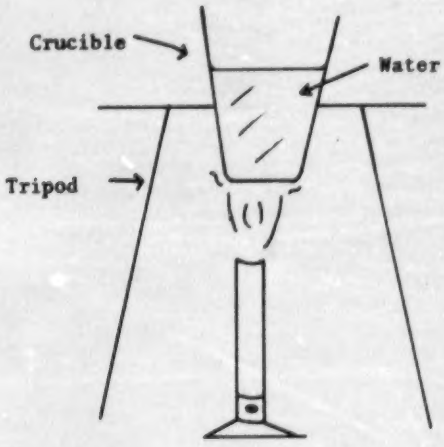
B2.

281

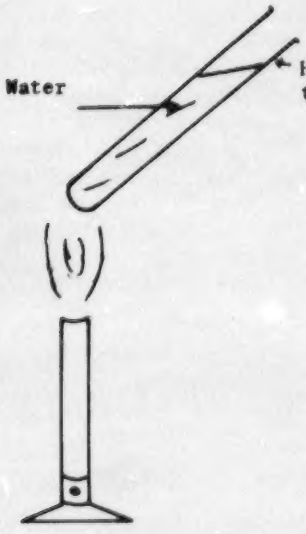
A student wishes to boil some water in the laboratory using standard laboratory equipment. Which of the following diagrams illustrates the most suitable method for doing this:



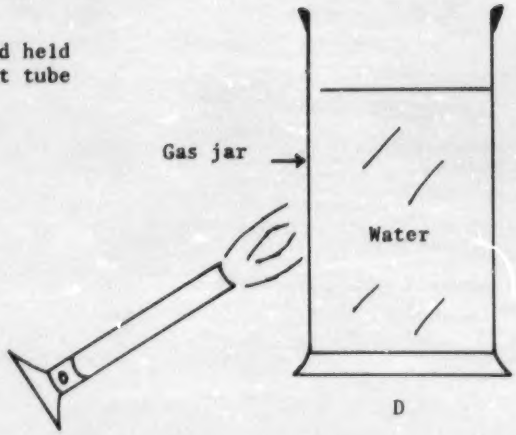
A



C



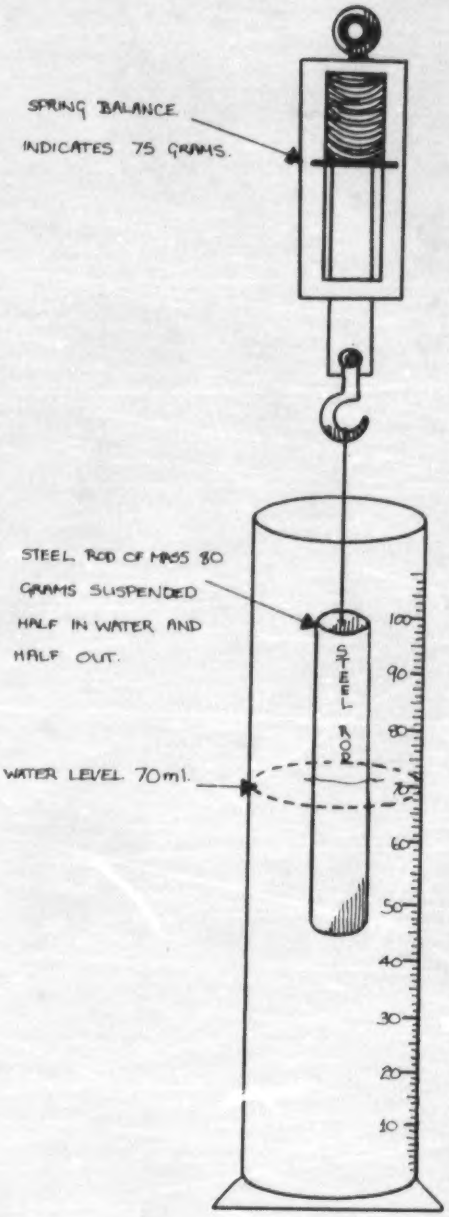
B



D

The next three questions refer to this diagram.

The diagram shows an 80 gram steel rod suspended by a spring balance in a cylinder of water so that the rod is half submerged. The spring balance shows 75 grams and the level of the water in the cylinder is 70 ml. Given that the density of water is 1 gram/ml answer the following questions.



If the rod were withdrawn from the water, then the level of the water would drop to

A. 65 ml.
B. 60 ml.
C. 55 ml.
D. 50 ml.

A2.

The volume of the steel rod is

A. 5 ml.
B. 10 ml.
C. 15 ml.
D. 20 ml.

B2.

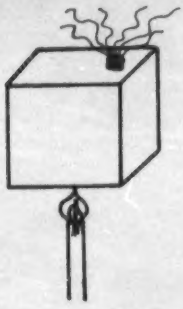
The density of the steel rod is

A. 5.0 gram/ml.
B. 7.5 gram/ml.
C. 8.0 gram/ml.
D. 10.0 gram/ml.

C1.

283, 284, 28

The next question refers to these diagrams.



CAN CONTAINING A LITTLE WATER WHICH IS BOILING

THE CAN A FEW SECONDS AFTER THE HEAT WAS REMOVED AND THE CAP SCREWED ON TIGHTLY

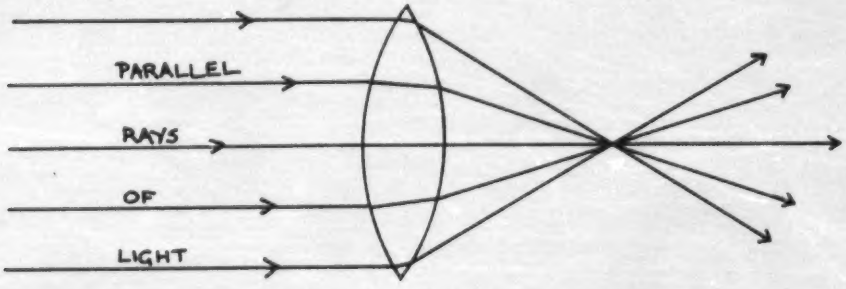
The crushed can in the second diagram was the result of

A. steam pressure.
B. water pressure.
C. heat pressure.
D. air pressure.

D3.
D3.

286

The next question refers to this diagram.



The focal length of the lens drawn above in millimetres, is nearest to

A. 10 B. 20 C. 40 D. 60

C3.

287

It has been suggested that in an emergency a well-shaken can of fizzy drink could be used as a fire extinguisher. If you were in such an emergency and had a range of cans available, it would be best to use a can which is

A. already open.
B. warm.
C. frozen.
D. chilled.

B3.

288

The following statement refers to an energy source:
"There are no machines, no burning to pollute and no extraction process."
Of the following the most likely energy source is

A. coal and coke.
B. petroleum.
C. uranium.
D. underground steam.

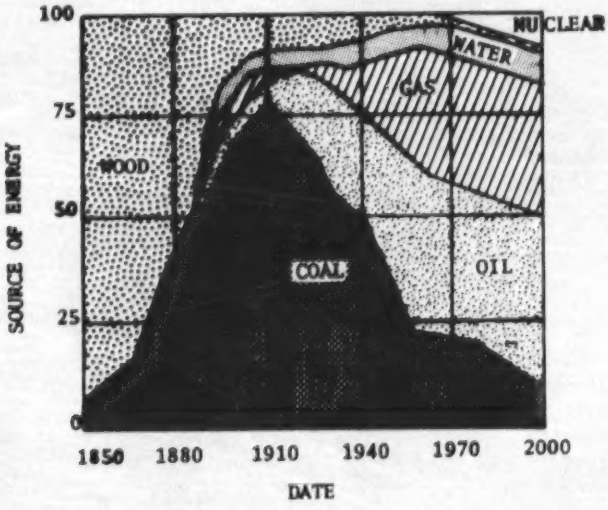
D4. 289

The fuels used by man for cooking include wood, oil, coal, and gas. The thing which these have in common is that they all

A. will run out by the year 2000.
B. are renewable resources.
C. are fossil fuels containing chemical energy.
D. release carbon dioxide when they are burnt.

D3. 290

The next question refers to this diagram.

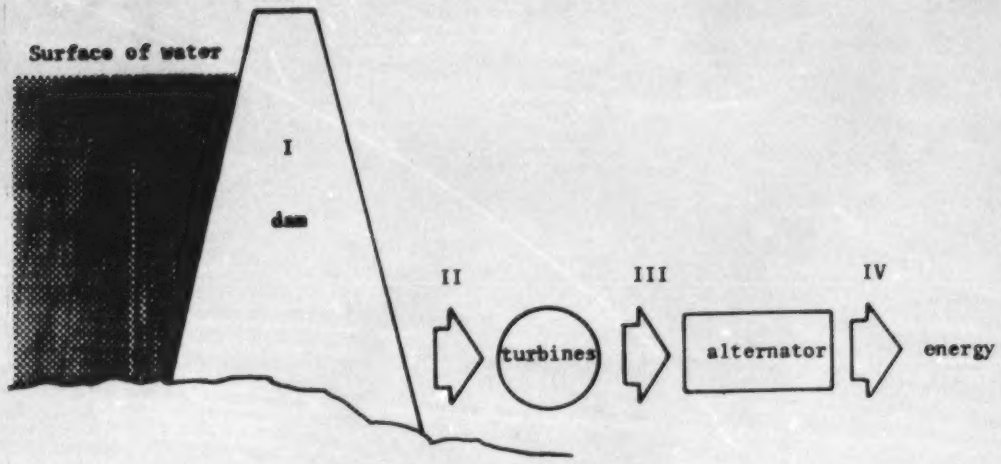


The diagram shows the % of energy used on earth as the source of the energy for the years 1850 to 2000 (predicted). The diagram shows that

A. burning wood was the only source of energy before 1850.
B. in 1940, coal supplied about 50% of the energy used.
C. nuclear energy wasn't discovered until about 1960.
D. the coal reserves of earth have been decreasing since 1910.

B2. 291

The diagram represents a hydroelectric power-generation system.



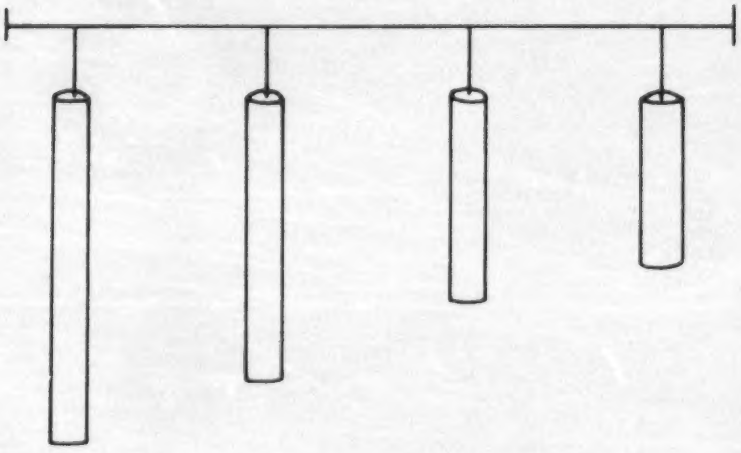
The energy change from positions III to IV is

A. potential to electrical.
B. electrical to kinetic.
C. kinetic to electrical.
D. electrical to potential.

C2.

292

The following diagram shows four metal bars hanging from string.



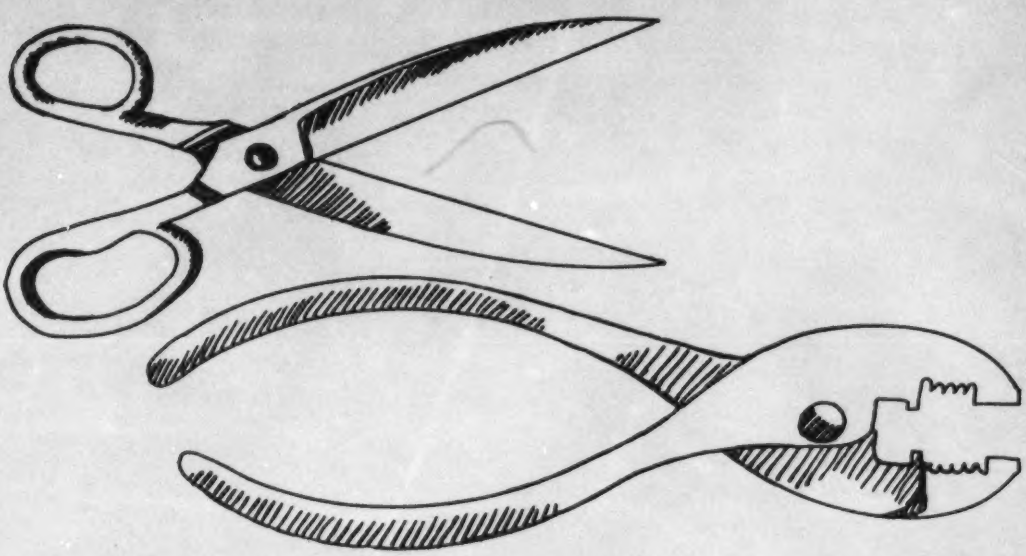
When these bars are struck with a hammer, they emit different sounds (some high notes, some low notes). The best explanation for this difference is that

A. the bars are made from different types of metals.
B. the bars were struck at different points along their length.
C. the different bars vibrate at different rates.
D. some are struck hard and some are struck softly.

C.5

293

This question refers to the following diagrams.



The pliers can exert a much greater force than the scissors. This is because the pliers

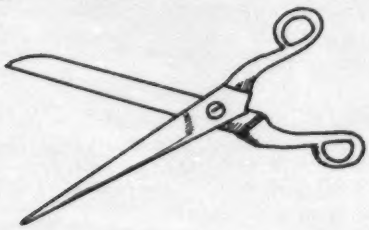
A. are heavier than the scissors.
B. have longer handles than the scissors.
C. grip better than the scissors.
D. are not as sharp as the scissors.

B3.

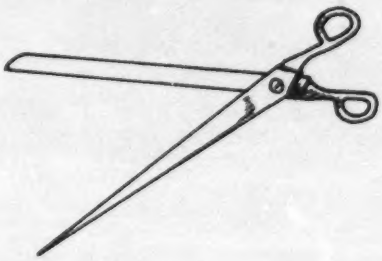
294

If you wanted to cut a piece of thick cardboard, with which pair of scissors from the following would you need to apply least force?

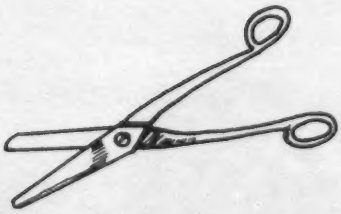
A.



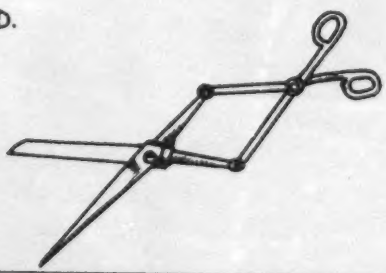
C.



B.



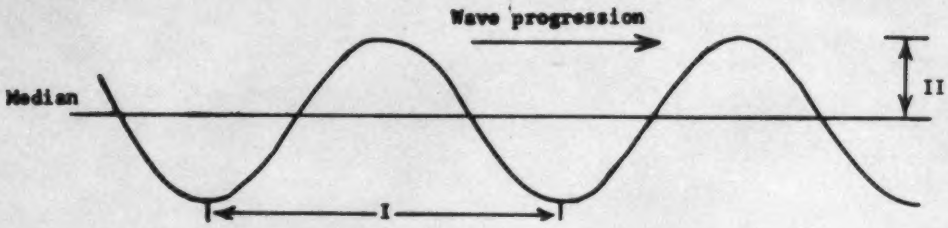
D.



B2.

295

The next two questions refer to the following information.
This diagram represents a transverse wave motion in a spring.



The measurement shown as I is the

A. displacement.
B. amplitude.
C. frequency.
D. wavelength.

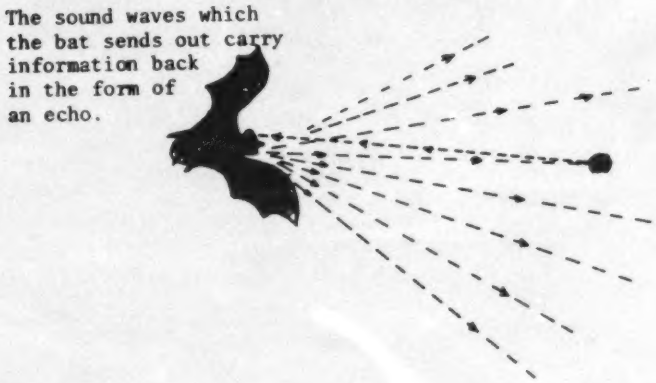
D4. 296

The measurement shown as II is the

A. displacement.
B. amplitude.
C. frequency.
D. wavelength.

B3. 297

A bat can safely fly through a forest of trees even in complete darkness. This diagram shows how it can do this:-



The property that sound waves (and all other waves) have which allows the bat to use them as a guide is that waves

A. bend when slowed down.
B. bounce off surfaces at the same angle that they strike them.
C. travel faster in some substances than in others.
D. pass right through some substances.

B4. 298

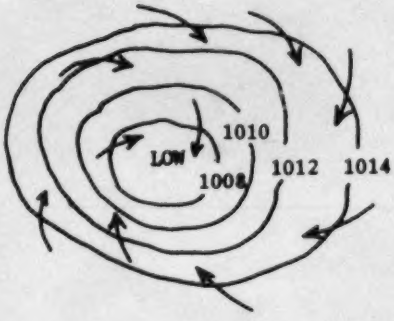
The proportion of water vapour in the air is called

A. condensation.
B. humidity.
C. evaporation.
D. hydration.

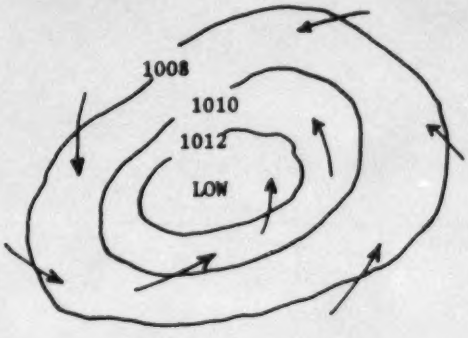
B3. 299

This question refers to the following information.

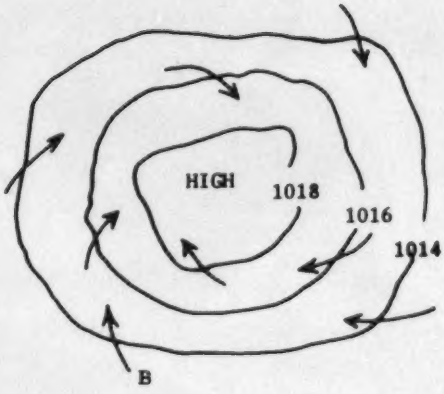
The diagrams below represent some atmospheric pressure systems which could appear on a weather map. The arrows represent wind direction at various points in the systems. All systems are drawn to the same scale.



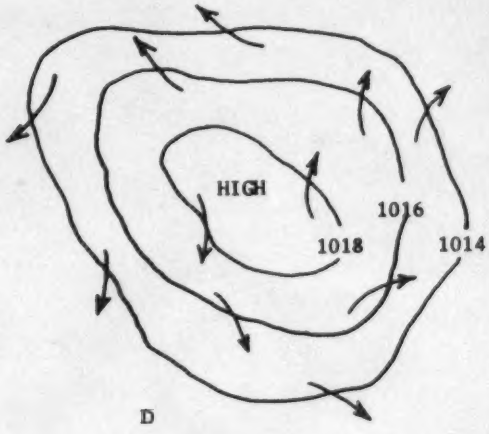
A



C



B

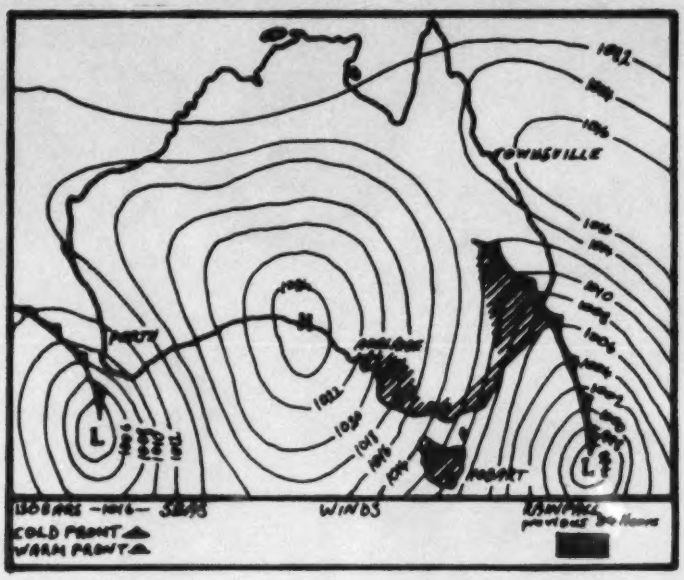


D

Which of the above diagrams (A,B,C or D) best represents a cyclone typical of the southern hemisphere?

A3. 300

The next question refers to this weather map.



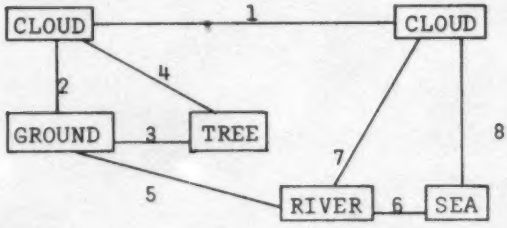
Using the information shown on the weather map above which city will probably receive rain next?

A. Adelaide.
B. Hobart.
C. Perth.
D. Townsville.

C3.

301

The following simplified diagram shows how water is cycled in nature. Lines represent movement of water.



Evaporation could be represented by which lines on the diagram?

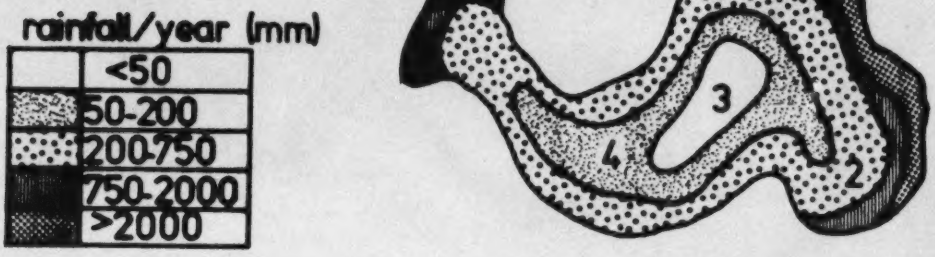
A. 1, 2, 6 and 8.
B. 2, 4, 7 and 8.
C. 3, 4, 5 and 8.
D. 4, 5, 7 and 8.

B3.

302

The next three questions refer to the following information.

The map below shows a region on the planet Xenos and the rainfall distributions over the region.



In which region would you expect to find the Xenos equivalent of rainforest?

A. 1
B. 2
C. 3
D. 4

A.2

303

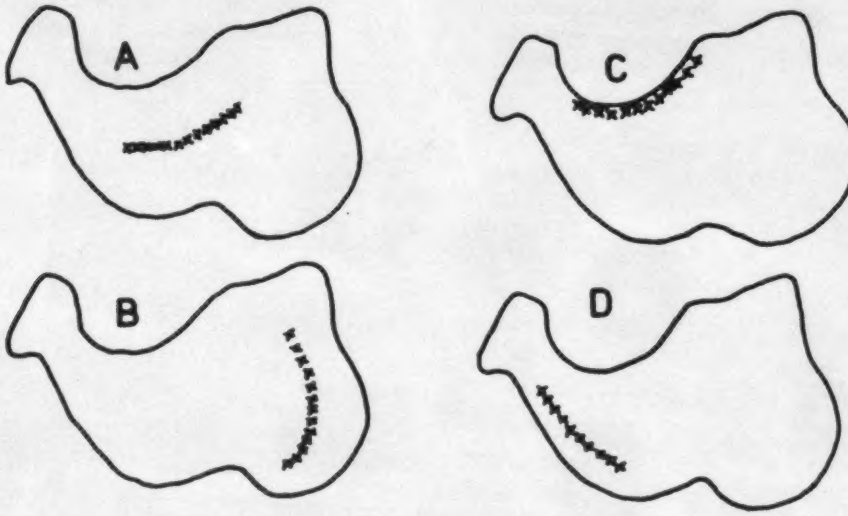
Some plants from Earth are being tried out on Xenos. Which of the plants below would you most expect to succeed in region 3?

A. grasses
B. ferns
C. gum trees
D. pine trees

A.1

304

Which map below best shows the most probable position of a mountain range?

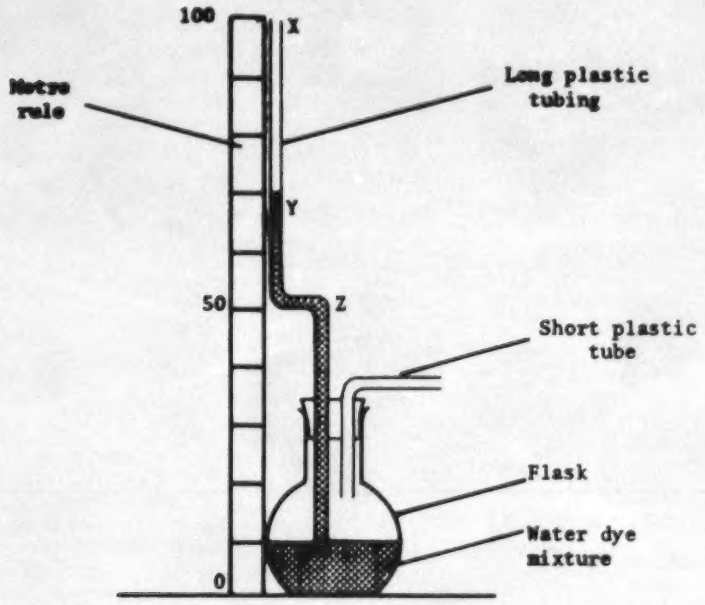


B.2

305

The next 3 questions refer to the following information.

The diagram below represents apparatus used in an experiment designed to measure the maximum pressure exerted by a person's breath. The person blows into the short plastic tube as hard as he can, forcing fluid from the flask into the long plastic tubing as shown in the diagram. The maximum breath pressure is measured by the difference between the level of liquid in the flask and the level in the tube.



To answer the questions assume that the above diagram depicts the measurement of the maximum breath pressure of a particular person.

To read the level in the long plastic tubing the experimenter should position his eyes

A. as close to the short plastic tube as possible.
B. in position X.
C. in position Y.
D. in position Z.

The diagram indicates that the person has a maximum breath pressure of

A. 50 cm of liquid.
B. 60 cm of liquid.
C. 70 cm of liquid.
D. 100 cm of liquid.

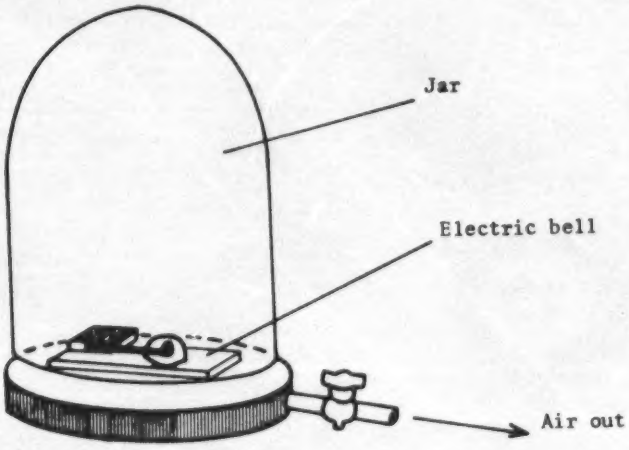
B.1 307

If a person is found to have a maximum breath pressure well below the average for his age, he is most likely suffering from a disease of the

A. heart.
B. lungs.
C. liver.
D. kidneys.

B.4 308

This question refers to this diagram.



The apparatus above shows an electric bell inside a large jar from which the air may be pumped out. As the air is pumped out of the jar the sound of the bell grows progressively fainter until it cannot be heard at all even though the bell is still working. The best conclusion we can draw from this experiment is

A. electricity cannot travel through a vacuum.
B. sound can travel only through air.
C. glass is a good absorber of sound.
D. air is necessary to transmit sound.

D.3 309

The next three questions refer to the following information.

Alcohol accounts for more serious road accidents in Australia than all other causes combined.
To test the effect of alcohol on drivers, researchers carried out tests on 500 heavy drinkers and 500 non-drinkers. They tested drivers' reactions to emergency situations at various blood alcohol levels. The results are shown below:

HEAVY DRINKERS

ALCOHOL BLOOD LEVEL	AVERAGE NUMBER OF MISTAKES
0.00%	3.6
0.05%	5.7
0.08%	13.1
0.10%	21.2

NON-DRINKERS

ALCOHOL BLOOD LEVEL	AVERAGE NUMBER OF MISTAKES
0.00%	3.5
0.05%	5.8
0.08%	13.2
0.10%	20.9

From the results the researchers could conclude

A. alcohol has no effect on the reactions of drivers.
B. alcohol has similar effects on the driving ability of heavy drinkers and non-drinkers.
C. the legal blood alcohol level should be raised to 0.10%.
D. non-drinkers made no mistakes when there is no alcohol in their blood stream.

B.4

310

The reason for carrying out the driving test with a blood alcohol level of 0.00% is to

A. show that only drinkers should be allowed to drive.
B. show that drivers who don't drink don't make any mistakes.
C. have a control with which to compare the various blood alcohol levels.
D. demonstrate that alcohol doesn't matter because everyone makes mistakes.

C.3

311

The reason for having such large groups in the experiment was to

A. remove the chances of errors.
B. show that everyone is different and so a single legal blood alcohol limit is unsatisfactory.
C. have people with all sorts of drinking habits tested.
D. make sure that people who drove every type of car were represented in the test.

A.1

312

Which cartoon character is simply asking a question rather than proposing an hypothesis?

A
You'll be using some strong acids in this experiment, so be careful you don't burn yourself.
Let's see, I'm going to find out how metals react with acids ... Hey, I didn't know that vinegar is an acid! I'll bet that the metals won't react very much with vinegar!
B
Listen, if enzymes are so fussy, why do they hang around with dirt?
BUST
C
Why is one part of the flame hotter than the others? Does it have anything to do with the amount of oxygen you let into the burner?
D
Why does the sun change colour when it's near the horizon? The flames of the sun don't change colour do they?

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Which of the following methods of communication has the most effect on the life of a school pupil?

A. Newspapers and magazines.
B. Radio and television.
C. Telephones and telecommunications.
D. Postcards and letters.

B5.

314

Communication is studied as a part of your science course because

A. everyone needs to understand how televisions work.
B. radio plays a big part in controlling the movement of aeroplanes.
C. most people have their own transistor radios.
D. effective communications are an essential part of our society.

D5.

315

All the time, you are receiving information from your surroundings. How much of this information is brought to you by some kind of wave?

A. None at all.
B. Very little.
C. About half.
D. Almost all.

D4.

316

Much information we receive from our environment comes to us in the form of waves. Which of the following is an example of this?

A. Flavour of our food.
B. Odour of a flower.
C. Listening to a record.
D. Feeling a rough surface.

C4.

317

A scientist wishes to send a large quantity of information from a space capsule travelling through the Solar System back to scientists on Earth.
The most suitable means of transferring this information would be by

A. coaxial cable.
B. gamma radiation.
C. light messages.
D. radio signals.

D2.

318